Initial Environmental Examination

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IND: Karnataka Integrated Urban Water Management Investment Program (Tranche 2) – Improvements for 24x7 Water Supply System – Distribution System for City Municipal Council, Udupi

Package No: 02UDP01

Prepared by Karnataka Urban Infrastructure Development and Finance Corporation, Government of Karnataka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 11 May 2017)

Currency unit	–	Indian rupee (₹)
₹1.00	=	$0. 0149
$1.00	=	₹67.090

ABBREVIATIONS

ADB	–	Asian Development Bank
ASI	–	Archaeological Survey of India
CTE	–	consent to establish
CTO	–	consent to operate
CMC	–	City Municipal Council
CPHEEO	–	Central Public Health and Environmental Engineering Organization
CPCB	–	Central Pollution Control Board
CRZ	–	coastal regulation zone
EHS	–	environmental, health and safety
EIA	–	environmental impact assessment
EMP	–	environmental management plan
GLSR	–	ground level service reservoir
GRC	–	grievance redress committee
GRM	–	grievance redress mechanism
HDPE	–	high density poly ethylene
IEE	–	initial environmental examination
IFC	–	International Finance Corporation
KIUWMIP	–	Karnataka Integrated Urban Water Management Investment Program
KSPCB	–	Karnataka State Pollution Control Board
KUIDFC	–	Karnataka Urban Infrastructure Development and Finance Corporation
MOEFCC	–	Ministry of Environment, Forest and Climate Change
NGO	–	nongovernment organization
OHS	–	occupational health and safety
OHT	–	overhead tank
PIU	–	program implementation unit
PMDCSC	–	project management, design and construction supervision consultant
PMU	–	program management unit
REA	–	rapid environmental assessment
RPMU	–	regional program management unit
SEIAA	–	State Environmental Impact Assessment Authority
SEMP	–	site environmental management plan
SPS	–	Safeguard Policy Statement
ULB	–	urban local body
VHPP	–	Varahi Hydal Power Project
WTP	–	water treatment plant

WEIGHTS AND MEASURES

dBA	-	A-weighted decibel
cusec	-	cubic foot per second
m^3	-	cubic meter
^oC	-	degree Celsius
dia	-	diameter

ha	-	hectare
kl	-	kiloliter
km	-	kilometer
m	-	meter
$\mu g/m^3$	-	microgram per cubic meter
ml	-	milliliter
mm	-	millimeter
MLD	-	million liters per day
km^2	-	square kilometer

NOTE

In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

The Asian Development Bank (ADB) funded Karnataka Integrated Urban Water Management Investment Program (KIUWMIP) aims to improve water resource management in urban areas in a holistic and sustainable manner. Investment support will be provided to modernize and expand urban water supply and sanitation while strengthening relevant institutions to enhance efficiency, productivity and sustainability in water use. Udupi 24x7 water supply distribution network subproject is one of the subprojects proposed in Tranche 2.

Categorization. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in its Safeguard Policy Statement (SPS), 2009. The proposed projects are categorized as A, B, C or FI to determine the level of environmental assessment required. Udupi water supply subproject is classified as Environmental Category B as per ADB SPS, 2009 as no significant impacts are envisioned. Accordingly, this initial environmental examination (IEE) report has been prepared. The bulk water supply components proposed under the government funding are essential for successful operation of this package. Thus, due diligence for both ADB and government-funded components have been included in this IEE.

Subproject Scope. Subproject includes the following components: (i) clear water feeder mains of 7.47 kilometer (km) of diameter 150 millimeter (mm) to 355 mm to feed to new overhead tanks (OHT); (ii) 7 OHTs of total storage capacity 5.2 million liters (ML); (iii) distribution network of 358.16 km (diameter 150 mm to 355 mm); and (iv) replacement of 16,870 existing meters (m) and providing new metered house service connections of 15,000 for uncovered households. Distribution network pipes will be laid along existing road right-of-way (ROW) and OHTs will be constructed in government-owned lands. An existing non-functional irrigation intake site about 40 km from Udupi on River Varahi has been selected for the new water intake. An intake channel and pumping station already exists, and same intake and pump house will be rehabilitated and utilized.

Implementation Arrangements. Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC) is the executing agency responsible for overall technical supervision and execution of all subprojects funded under the Investment Program. Implementation activities are overseen by program management unit (PMU) established in its head office at Bangalore in coordination with its regional office (RPMU) in Mangalore. PMU and RPMU are staffed with technical, administrative and financial officials, including safeguards specialists, to manage and monitor program implementation. The implementing agencies are the respective urban local bodies (ULBs). For this package, the implementing agency is City Municipal Council (CMC) of Udupi. A program implementation unit (PIU) has been set up for implementation of day-to-day activities in the field. A consultant team, Project Management, Design and Construction Supervision Consultant (PMDCSC), assists PMU, RPMU and all PIUs in subproject planning and management, assures technical quality of design and construction, designs the infrastructure, and supervises construction including conducting all safeguards tasks.

Description of the Environment. The subproject components are located in Udupi urban area. No private land required for this subproject. There are no environmentally-sensitive areas such as protected areas, wetlands, mangroves, or estuaries in or near the subproject locations. The bulk water system component sites are located mostly outside the urban area – intake site is located on the bank of River Varahi, and water treatment plant (WTP) site is located adjacent to existing WTP in Baje. WTP site located a forest land but the area and its surroundings have

already been developed and not considered environmentally-sensitive area. The transmission pipeline will be laid along roads right-of-way.

Source Sustainability. At present, River Swarna is the main source of water supply of Udupi, and under a government funded bulk water supply project (partly funded by the central government funded AMRUT scheme and partly by Government of Karnataka funding), it is proposed develop an additional source (River Varahi) because the flow in River Swarna is very low during summer season (available only for duration of 101 days from February to May. The proposed new source, together with the existing, will ensure adequate water supply for Udupi throughout the year. The Varahi Hydal Power Project (VHPP) and an irrigation weir is located on the upstream site of proposed intake. VHPP discharges 1,100 cubic feet per second (cusec) of water into river course throughout year, of which 800 cusec is for irrigation use and remaining 300 cusec is available for drinking and river flow purposes. It is proposed utilize this available source mainly for the summer season to augment the water coming from River Swarna. At present, Kundapura is the only major town in the downstream of the proposed Udupi intake. Kundapura is also utilizing River Varahi with a total demand of 7.6 million liters per day (MLD) or 3.9 cusec. With Udupi's design demand of 48 MLD or 20 cusec, the combined demand of the two towns is 23.9 cusec or 7.97% of the available flow. Thus 92% of remaining flow or 74 cusec will be available for downstream users. Therefore, there are no significant impacts related to source sustainability or downstream impacts.

Potential Environmental Impacts. No significant impacts are anticipated either due to location or design of the subproject as the sites are selected and fixed ensuring components are not located in environmentally-sensitive areas. However due to the project sites being in urban areas and nature of open cut method for pipelaying works, unavoidable impacts include (i) health and safety hazards to workers during construction and operation, (ii) noise and dust from construction activities, (iii) increased road traffic due to interference of construction activities, (iv) soil erosion/silt runoff from construction waste soils, and (v) increased sewage flow due to increased water supply. These impacts during construction and operation can be mitigated through good and high-quality construction and operations and maintenance (O&M) practices. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be affecting small areas only.

Environmental Management Plan. The purpose of the environmental management plan (EMP) is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEMP. No works are allowed to commence prior to approval of SEMP.

A copy of the updated EMP / SEMP must be kept on work sites at all times. The EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts, (ii) carry out all of the monitoring and mitigation measures set forth in the EMP, and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

Mitigation measures for identified impacts include: (i) implementing a health and safety plan and providing regular orientation to workers, (ii) noise-producing activities will be kept at minimum by using silencers and working during periods when it will be least affecting sensitive receptors, (iii) water spraying of surroundings to minimize dust, (iv) implementing traffic management plan in coordination with local traffic enforcers, (v) reuse of waste soils, and (vi) improving the sewerage system as part of KIUWMIP. Contractors will be providing planks to create access to ensure businesses are not affected.

Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to PMU. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population. There will also be regular and periodic monitoring surveys for quality of water (at intake, reservoirs and at consumer end).

Consultation, Disclosure and Grievance Redress: The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations and will be disclosed to a wider audience via the ADB and KUIDFC websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and can participate in its development and implementation. A project-specific grievance redress mechanism is proposed and described in the IEE to ensure any public grievances are addressed quickly.

Monitoring and Reporting. The PMU, RPMU, PIUs, consultants will be responsible for monitoring the contractors. PMSDC will submit monthly monitoring reports to RPMU, and the PMU will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

Permits and Clearances Required. Environmental Clearance requirement per Government of India Environmental Impact Assessment Notification is not applicable to this subproject. No environment-related statutory clearance or permissions required for ADB-funded components. The government-funded bulk water intake will require permission from Irrigation and while the WTP will require clearance from the Forest Department.

Conclusions and Recommendations. The citizens of the Udupi will be the major beneficiaries of this subproject as the environmental condition and over-all health of the community will be improved. With the improved bulk water supply, they will be provided with a constant supply of better quality water, piped into their homes. The replacement of old distribution lines shall avoid cross contamination and have positive benefit on health by avoiding diseases such as diarrhea and dysentery, resulting in less expenses on healthcare, improve working days and their economic status.

Based on the findings of the IEE, there are no significant impacts and the subproject as Category "B" is confirmed. No further study or detailed environmental impact assessment (EIA) is required to comply with ADB SPS (2009).

I. INTRODUCTION

A. Background

1. The Karnataka Integrated Urban Water Management Investment Program (KIUWMIP, the Program) aims to improve water resource management in urban areas in a holistic and sustainable manner. Investment support will be provided to modernize and expand urban water supply and sanitation (UWSS) while strengthening relevant institutions to enhance efficiency, productivity and sustainability in water use. The Program focuses on priority investments and institutional strengthening in water supply and sanitation within an integrated water resource management (IWRM) context.

2. The executing agency is the Karnataka Urban Infrastructure Development Finance Corporation (KUIDFC) and implementing agencies for the Investment Program will be respective urban local bodies (ULBs). Kundapura, Mangalore, Puttur, and Udupi are the four towns chosen to benefit from the Tranche 2 of the investment.

3. The expected outcome will be urban water resource management in four coastal towns (Kundapura, Mangalore, Puttur and Udupi) improved. The outputs are (i) UWSS infrastructure expanded and upgraded; (ii) water resource planning, monitoring and service delivery improved; and (iii) institutional capacity of KUIDFC and ULBs strengthened capacity. This initial environmental examination (IEE) is based on an assessment water supply projects within the project area i.e. Udupi.

4. **Subproject Scope** Subproject includes the following components: (i) clear water feeder mains of 7.47 kilometer (km) of diameter 150 millimeters (mm) to 355 mm to feed to new overhead tanks (OHTs); (ii) 7 OHTs of total storage capacity 5.2 ml; (iii) distribution network of 358.16 km (diameter 150 mm to 355 mm); and, (iv) replacement of 16,870 existing meters and providing new metered house service connections of 15,000 for uncovered households. Distribution network pipes will be laid along existing road right-of-way (ROW) and OHTs will be constructed in government-owned lands. An existing non-functional irrigation intake site about 40 km from Udupi on River Varahi has been selected for the new water intake. An intake channel and pumping station already exists, and same intake and pump house will be rehabilitated and utilized. As Irrigation Department is yet to issue the no objection clearance (NOC) for the use of their facilities for Udupi water supply scheme, the regional program management unit (RPMU) and program implementation unit (PIU) has also considered constructing a new intake on the same location if the NOC will not be issued.

B. Background of Initial Environmental Examination

5. **Categorization.** ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in its Safeguard Policy Statement (SPS), 2009. The proposed projects are categorized as A, B, C or FI to determine the level of environmental assessment required.[1] Rapid environmental assessment

[1] Per ADB SPS, the environmental categorization and level of environmental assessment required for each category are as follows: (i) **Category A**: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required. (ii) **Category B**: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible and, in most cases,

using ADB's rapid environmental assessment (REA) checklist for Water Supply Scheme components were conducted, and results of the assessments show that Udupi water supply subproject is classified as Environmental Category B as per ADB SPS, 2009. Accordingly, this IEE report has been prepared. The government-funded components are essential for successful operation of this subproject. Thus, due diligence for both ADB and government-funded components have been included in this IEE.

6. **Scope of the Initial Environmental Examination.** The IEE is prepared based on detailed engineering design of the subproject. Assessment of potential impacts are based on secondary sources of information and field reconnaissance surveys; no field monitoring (environmental) survey was conducted. Stakeholder consultation was an integral part of the IEE. The IEE will be updated/revised if there are changes in site/locations and design of component during design validation and preconstruction phase. It will also be updated/revised based on contractor's site-specific environmental management plan (EMP). The updated/revised IEE will be submitted to ADB for review and disclosure. No works will be conducted until ADB has cleared the updated/revised IEE.

7. **Report Structure.** This IEE was prepared following KIUWMIP's environmental assessment and review framework and ADB SPS, 2009.[2] The report comprises the following sections: (i) introduction, (ii) description of project components, (iii) policy and legal framework, (iv) description of the environment, (v) screening of potential environmental impacts and mitigation measures, (vi) public consultation and information disclosure, (vii) grievance redress mechanism, (viii) environmental management plan, and (ix) conclusion and recommendations.

II. DESCRIPTION OF THE PROJECT COMPONENTS

8. Udupi is located at a latitude of 13°33′ N and longitude of 74°74' E. Situated at about 60 km north of the industrial hub Mangalore and about 422 km northwest of Bangalore. Udupi has the status of a City Municipal Council (CMC). Udupi is divided into 35 wards and spreading to an area of 69.28 square kilometers (km^2). The population in Udupi is 125,350 according to the Census 2011.

A. Need for Infrastructure Improvement in Udupi

9. A detailed assessment of existing situation was carried out and it concludes that the present water production of 27.24 million liters per day (MLD), is insufficient to meet water demand of Udupi till the year 2031 as per national standards (Table 1). Besides Udupi town, this subproject investment also need to provide water supply covering 5 en-route villages, 5 outgrowth villages and 7 adjacent villages. The present inadequacy in the water supply system, is due to (i) mainly shortage in water source in summer season; (ii) increased water demand; and (iii) old and leaking distribution system, along with weak management system.

mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required. (iii) **Category C:** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed. (iv) **Category FI**: A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary

[2] The environmental assessment and review framework has been prepared in 2014 during KIUWMIP loan approval. This has been updated during Tranche 2 to include recent Government of India's environmental laws, rules and regulations and Tranche 2 project components.

10. In order to meet required water demand of Udupi, an alternate water source from River Varahi is proposed under a government funded bulk water supply project.[3] The necessary improvements and augmentation in water distribution system is proposed under the ADB funded KIUWMIP Tranche 2.

11. **Source Augmentation**. At present, River Swarna is the main source of water supply of Udupi. Per observations made under the previous ADB funded Karnataka Urban Development and Coastal Environmental Management Project (KUDCEMP) for Udupi water supply, based on the river flow records between 1989 and 1994, the flow in River Swarna is observed to be very low during summer season, from February to May. For 101 days during summer, the flow in the river is almost negligible. Following Table 1 shows the water demand and supply gap in Udupi for the no flow season of 101 days.

Table 1: Udupi Water Demand and Supply Gap

No.	Description	Unit	Base Year	Intermediate Year	Ultimate Year
1	Project years		**2016**	**2031**	**2046**
2	Available water storage capacity in Baje Barrage	million cubic meter (MCM)	1.890	1.890	1.890
3	Available water storage capacity in Shiroor Mutt Barrage	MCM	0.734	0.734	0.734
4	Total gross storage (2+4)	MCM	2.624	2.624	2.624
5	Evaporation losses @20%	MCM	0.525	0.525	0.525
6	Net water storage capacity	MCM	2.099	2.099	2.099
7	Maximum daily water supply available from storage during very low / no river flow period of 101 days	MCM	0.0208	0.0208	0.0208
8	Water supply rate during 101 days	million liters per day (MLD)	20.780	20.780	20.780
9	Total bulk water demand of Udupi	MLD	37.370	44.990	54.710
10	Supply-demand gap and additional bulk water requirement of Udupi	MLD	16.580	24.210	33.930
	Say		17.000	24.500	34.000
11	Total additional bulk water supply from alternate source including demand of enroute villages from Haladi to Baje (12 villages)	MLD	21.000	30.000	41.000

12. Therefore, under the government-funded project, it is proposed to draw (pump) 41 MLD of water for four summer months from a new source (River Varahi) to meet the demand of projected population till 2046. The proposed new source, together with the existing, will ensure adequate water supply for Udupi throughout the year. The Varahi Hydal Power Project (VHPP) and an irrigation weir is located on the upstream site of proposed intake. VHPP discharges 1,100 cubic feet per second (cusec) of water into river course throughout year, of which 800 cusec is for irrigation use and remaining 300 cusec is available for drinking and river flow purposes.

[3] In parallel, a bulk water supply improvement for Udupi is being undertaken under by government funding –partly under the central government funded scheme, Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and partly by the Government of Karnataka funding. Components proposed under AMRUT scheme include: (i) construction of intake well at Bharathkal, Varahi River, (ii) construction of jack well cum pump house at Bharathkal, (iii) raw water pumping main 38 km from Bharathkal to Baje (864 mm diameter), (iv) construction of jack well at Baje (v) raw water pumping main (762 mm diameter) 0.31 km, and (vi) construction of 30 MLD water treatment plant (WTP) at Baje. A clear water transmission main (762 mm diameter) for 11.74 km from Baje to Manipal is being taken up under the Government of Karnataka funding. The implementation arrangement for this project is as follows: KUIDFC as executing agency and Udupi CMC as implementation agency will be responsible for implementation.

13. It is proposed to utilize existing abandoned lift irrigation scheme jack well for pumping raw water to Udupi (only civil structures). Government-funded bulk water supply project will fund replacement of pumping machineries and panels, transformers in the existing jack well and raw water main for 38 km from Jack well at Bharathkal to existing water treatment plant (WTP) at Baje. Figures 1 and 2, respectively show River Varahi and proposed intake location at Bharatkal, near Halady, Kundapur**.** Figure 3 shows the alignment of raw water main from intake to WTP and Figure 4 shows the location of existing and proposed jackwell and WTP at Baje. The following are available information on the Varahi River source:

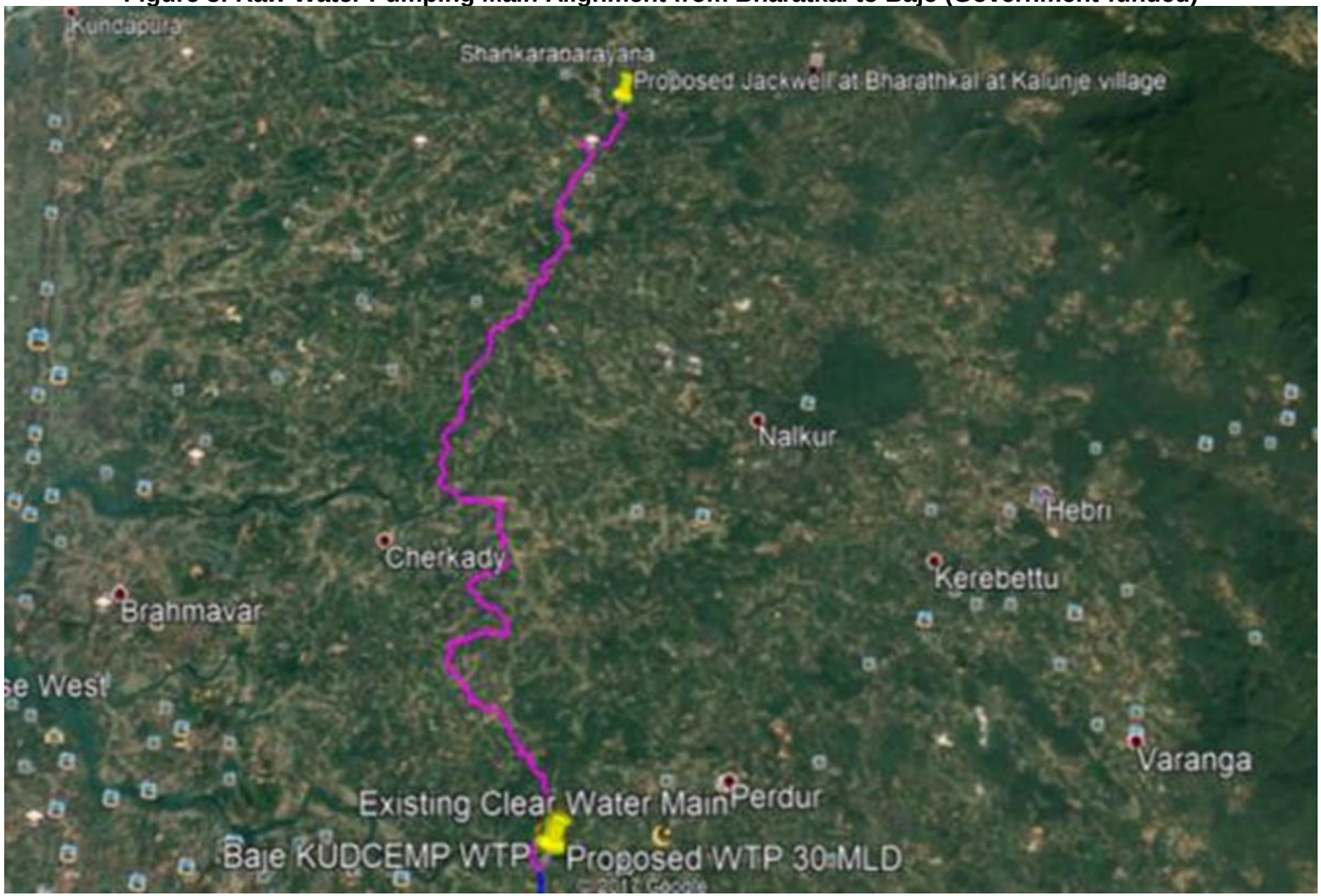
- Central Water Commission (CWC) has established river gauging station at Haladi in year 1984;
- Varahi Hydel Power Project (VHPP) located at Hosangadi about 19 km upstream of proposed intake / Jack Well site; VHPP, which releases an average tailrace discharge of 1,100 cubic feet per second (cusecs) every day;
- Karnataka Niravrai Nigam Limited (KNNL) constructed a weir at Siddapura, about 6.5 km downstream of VHPP. This weir will be about 13.5 km upstream of proposed intake/Jack well site. An irrigation project has been planned by KNPP with average discharge of 800 cusecs in the canal system;
- Even if the entire 800 cusecs is utilized for irrigation, the tailrace flow of remaining 300 cusecs will always be available in the river;
- The 2046 demand for Udupi is 41 MLD (for 4 months). This work out to be 20 cusecs, which is very small portion of tailrace flow of 300 cusecs; and
- At present, Kundapura is the only major town in the downstream of the proposed Udupi intake. Kundapura is also utilizing River Varahi with a total demand of 7.6 million liters per day (MLD) or 3.9 cusec. With Udupi's design demand of 48 MLD or 20 cusec, the combined demand of the two towns is 23.9 cusec or 7.97% of the available flow. Thus, 92% of remaining flow or 74 cusec will be available for downstream users. Therefore there are no significant impacts related to source sustainability or downstream impacts.

Figure 1: View of River Varahi at Bharathkal, Haladi

Figure 2: Location of Proposed Jack Well at Bharathkal, Haladi (Government-funded)

Source: Google Earth.

Figure 3: Raw Water Pumping Main Alignment from Bharatkal to Baje (Government-funded)



Source: Google Earth.

Figure 4: Existing and Proposed Jack Well and Water Treatment Plant Sites at Baje (Government-funded)

Source: Google Earth.

14. **Water Distribution System**. KIUWMIP Tranche 2 will include the Udupi water distribution system. Uniform distribution will be ensured throughout the area by dividing the service area into zones. The total operational service area in Udupi is divided into 10 administrative water supply distribution zones and 7 water supply distribution subzones (Figure 5). It is required to have continuous distribution system in order to reduce the real losses in the system, which are going to be measured in the private operator contract.

15. **Service Reservoirs – Overhead Tanks**. KIUWMIP Tranche 2 will include the construction of 7 OHTs of total storage capacity of 5.2 ML. Figure 6 shows the location of proposed OHTs and feeder mains. Presently water supply for Udupi is carried out by 10 water storage reservoirs of 11.65 ml capacity including 9 OHTs and 1 ground level service reservoir (GLSR). Each zone is proposed to be supplied with water from storage cum balancing reservoirs, which would be fed by water from the proposed Master GLSR at Manipal. OHTs have been proposed at various locations. The capacity of the Master GLSR and OHTs has been arrived at by considering the demand of the zones to be served by the reservoirs in Udupi only and the demands of outgrowths and adjacent villages have not been considered. Independent feeder mains to all the existing OHTs are provided.

16. For efficient and equitable distribution of water, grid or loop pattern distribution networks keep dead ends to a minimum. For the scientific analysis of the non-revenue water it is proposed to create district metering areas (DMAs) for about 500 to 2,500 connections. Boundary valves shall define the DMA areas and the valve shall be on closed condition and shall be operated only in the case of emergency.

17. The pipes layout is planned along the existing streets and roads. A minimum clear cover of 1 m is proposed for the buried pipelines. Due to recent widening of roads and in order to avoid road cutting for house service connections, additional pipeline is required for both sides of the major and important roads. KIUWMIP Tranche 2 will include (i) clear water feeder mains of 7.47 km of diameter 150 mm to 355 mm to feed to new OHTs; and (ii) distribution network of 358.16 km (diameter 150 mm to 355 mm – High Density Poly Ethylene and DI pipe). Figures 7 and 8 provide the alignment of the pipe network.

18. **House Service Connections**. House service connections using MDPE pipes and with multijet water meters have been proposed for the distribution system. KIUWMIP Tranche 2 will include replacement of 16,870 existing meters and providing new metered house service connections of 15,000 for uncovered households.

19. Table 2 provides details of the KIUWMIP Tranche 2 subproject components in Udupi based on the detailed engineering design of the subproject.

Table 2: Proposed Subproject Components

No.	Component	Details	Location
1	Clear water feeder main to feed treated water to overhead tanks (OHTs)	7.47 km length 150 mm – 355 mm diameter **Ductile Iron Pipes** • 1.50 km - 150 mm diameter from ground level service reservoir (GLSR) at Manipal to OHT for Zone 5 at Manipal near Manapalla lake • 0.5 km - 200 mm diameter from GLSR at Manipal to zone-3 OHT at Manipal **Mild Steel Pipes** • 60 m - 219 mm diameter for zone -7C OHT at Kolambe	Along the public roads within the road right of way

No.	Component	Details	Location
		• 45 m - 219 mm diameter for zone -8C OHT at Indrali • 1.7 km - 273.1 mm diameter for zone-6B OHT at Manchi • 815 m - 323.90 mm diameter for zone-8B at Kakkunje • 2.85 km - 355.6 mm diameter, for zone-9B at Santhekatte	
2	OHTs	7 OHTs of total storage capacity 5.2 ml • Zone 3 – 750 kl at Manipal • Zone-5 – 300 kl at Manipal near Manapalla lake • Zone 6B – 750 kl at Manchi • Zone 7C – 300 kl near Kolambe • Zone 8B – 1,000 kl at kakkunje • Zone 8C – 500 kl at Indrali Zone 9B – 1,600 kl at Santhekatte	For all 7 OHTs, government owned land parcels have been identified.
3	Distribution network	358.16 km pipes of diameter 63 mm to 350 mm **High Density Poly Ethylene (HDPE) pipes** • 63 mm dia - 294.4 km • 75 mm dia - 0.375 km • 90 mm dia - 0.796 km • 110 mm dia - 25.575 km • 160 mm dia - 3.336 km • 200 mm dia - 5.602 km • 250 mm dia - 13.824 km • 280 mm dia - 0.330 km • 315 mm dia - 0.291 km DI PIPES: • 150 mm dia - 0.252 km • 300 mm dia - 10.282 km • 350 mm dia- 3.098 km	Pipes will be laid along the public roads within the road right of way. Rider lines will be laid parallel to the existing pipes, and within the road right of way. Pipes will be mostly laid in earthen shoulder to avoid road cuttings
4	House Service Connections	Replacement of non-functioning 16,870 water meters for existing connections and providing new water supply connections of 15,000 to un-covered households	At each household

B. Implementation Schedule

20. Project implementation schedule is given below. Construction work is likely to start in April 2018 and will be completed by March 2021.

Completion of Detailed Project Report	October 2017
Tender issue	December 2017
Contract Award	March 2018
Commencement of work	April 2018
Completion of work	March 2021 (36 months)

21. The bulk water component proposed under the government funding is also being implemented parallel to the distribution package under KIUWMIP. Details are given below:

Completion of Detailed Project Report	October 2017
Tender issue	December 2017
Contract Award	March 2018
Commencement of work	April 2018
Completion of work	March 2020 (24 months)

Figure 5: Water Distribution Zones

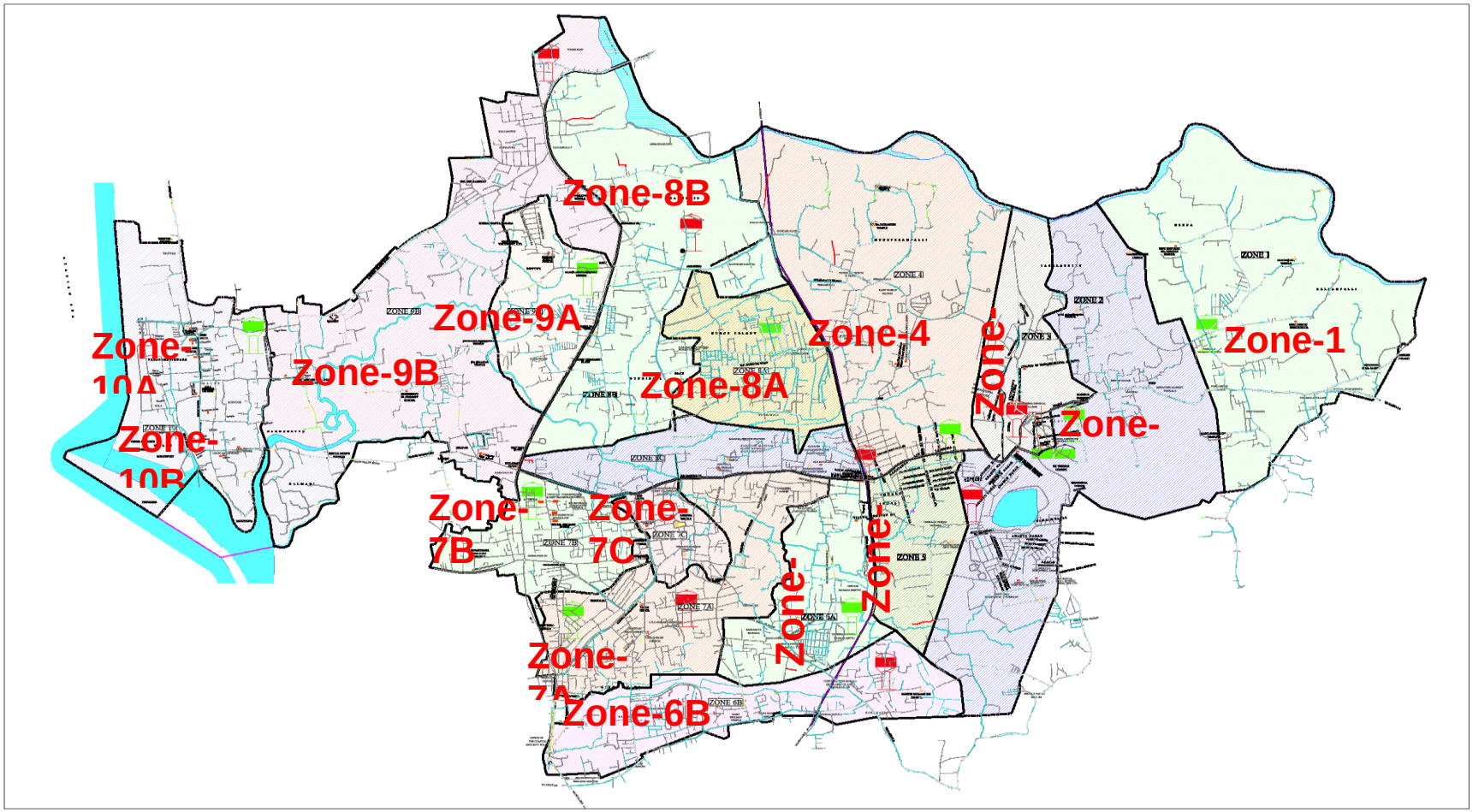


Figure 6: Existing and Proposed Clear Water Mains and Overhead Tanks

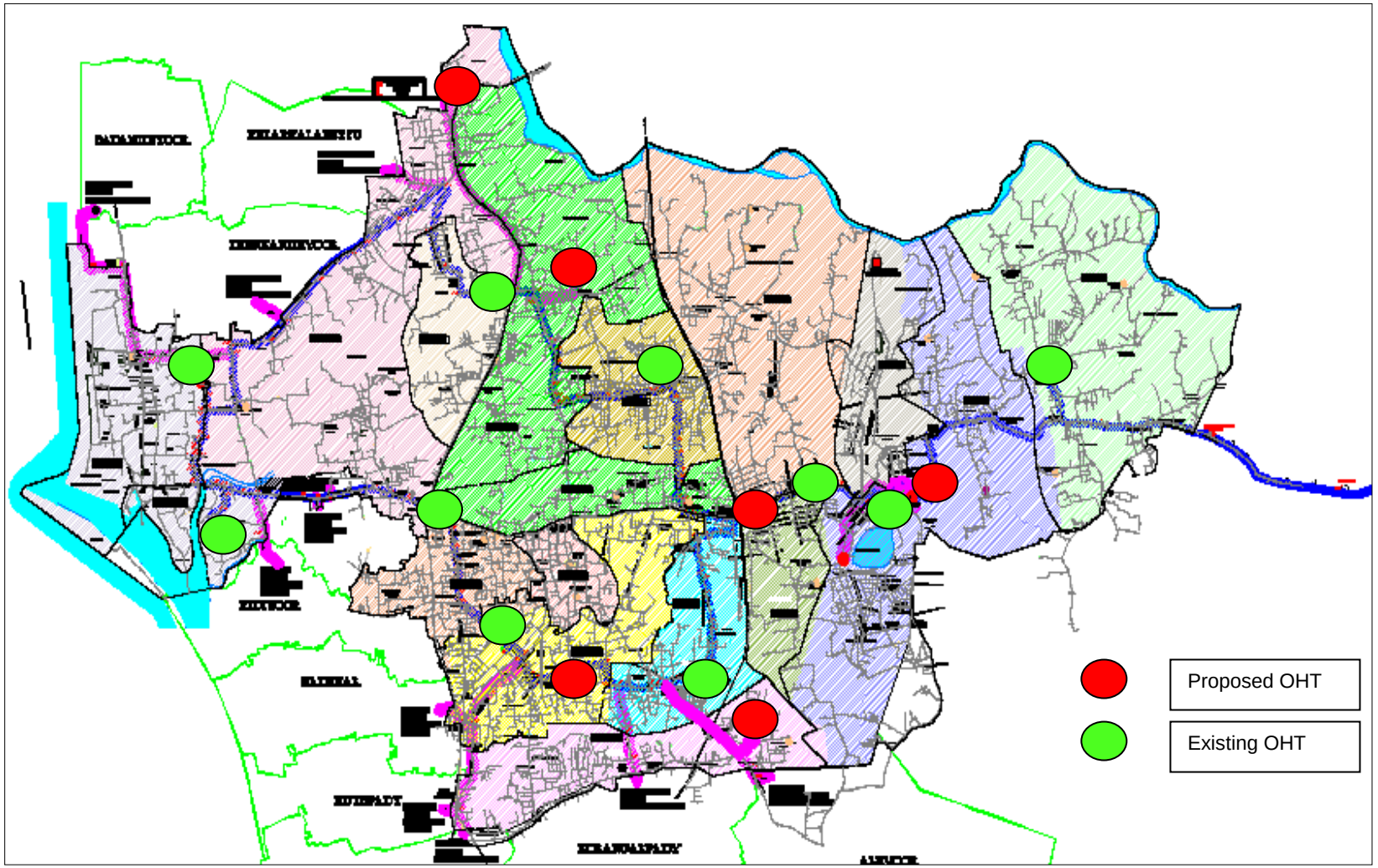


Figure 7: Map showing National Highway/Railway Crossing Details

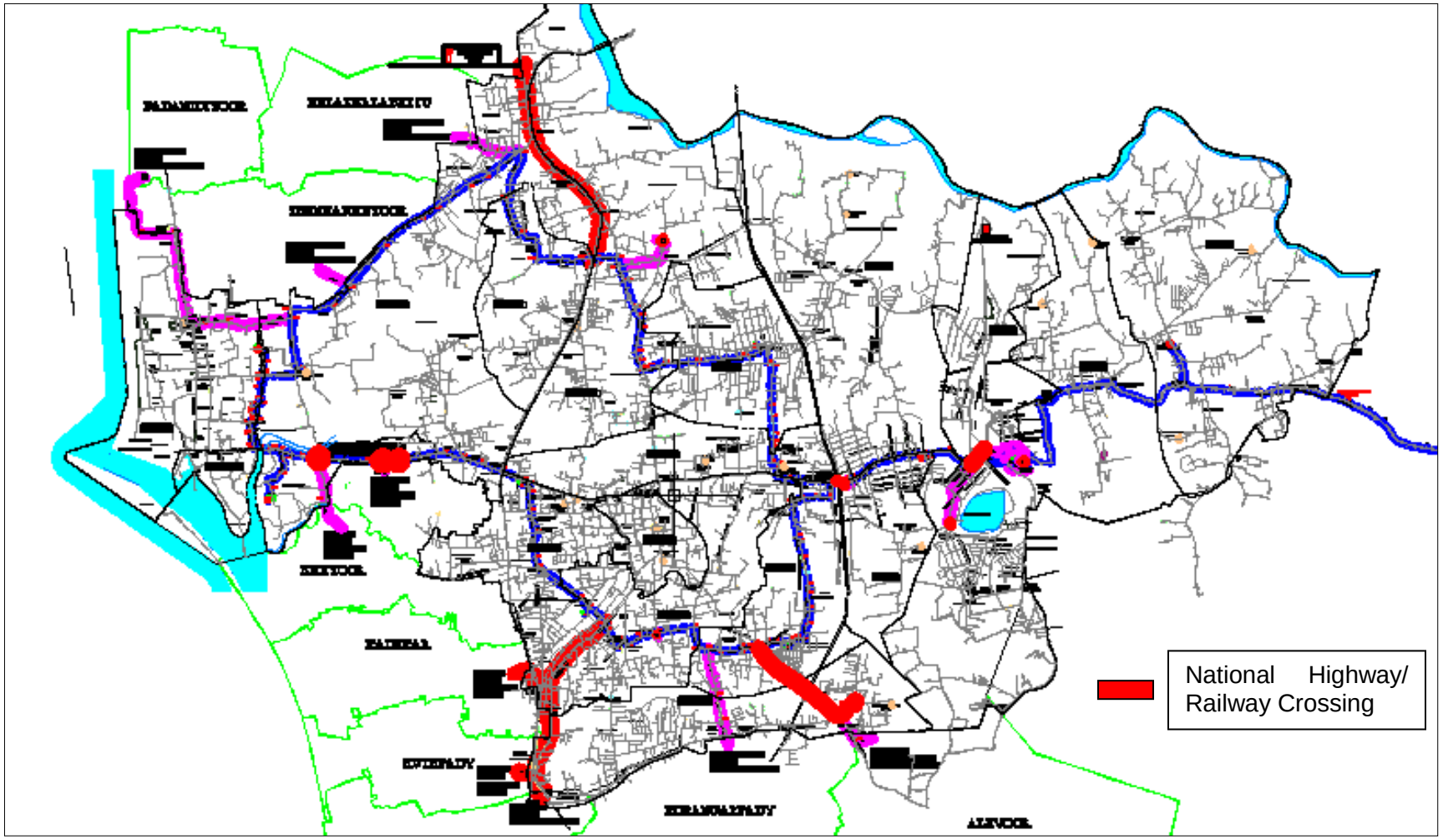


Figure 8: Proposed Udupi Water Treatment Plant

III. POLICY AND LEGAL FRAMEWORK

A. ADB Safeguard Policy Statement, 2009

22. ADB SPS, 2009 requires the consideration of environmental issues in all aspects of the Bank's operations and requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, financial intermediary loans, and private sector investment operations.

23. The nature of the assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts and are classified as category A, B, C or FI (footnote 1).

24. The ADB Rapid Environmental Assessment Checklist (General) in http://www.adb.org/documents/guidelines/environmentalassessment/eaguidelines002.asp was used to screen the project for environmental impacts and to determine the environment category. The complete checklist is given in Appendix 1.

25. ADB has classed this subproject as Category B and following procedure for multitranche financing facility (MFF) loans has determined that one IEE will be conducted for each subproject, with a subproject being the water supply infrastructure improvements proposed in a subproject city.

26. **Environmental Management Plan.** An EMP which addresses the potential impacts and risks identified by the environmental assessment shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks.

27. **Public Disclosure.** The IEE will be put in an accessible place (e.g., local government offices, libraries, community centers, etc.), and a summary translated into local language for the project affected people and other stakeholders. The following safeguard documents will be put up in ADB's website so that the affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:

(i) For environmental category A projects, a draft EIA report at least 120 days before Board consideration;
(ii) Final or updated EIA and/or IEE upon receipt; and
(iii) Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

28. During the design, construction, and operation of the project the pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the **World bank Environmental, Health, and Safety (EHS) Guidelines -General EHS Guidelines: Occupational, Health and Safety** (www.ifc.org/ifcext/enviro.nsf/Content/ Environmental guidelines) and EHS Guidelines for water and sanitation will be followed (http://www.ifc.org/wps/wcm/connect/e22c050048855ae0875cd76a6515bb18/Final%2B-%2BWater%2Band%2BSanitation.pdf?MOD=AJPERE).

29. Employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. Preventive and protective measures should be introduced according to the following order of priority:

(i) Eliminating the hazard by removing the activity from the work process. Examples include substitution with less hazardous chemicals, using different manufacturing processes, etc;
(ii) Controlling the hazard at its source through use of engineering controls. Examples include local exhaust ventilation, isolation rooms, machine guarding, acoustic insulating, etc;
(iii) Minimizing the hazard through design of safe work systems and administrative or institutional control measures. Examples include job rotation, training safe work procedures, lock-out and tag-out, workplace monitoring, limiting exposure or work duration, etc;
(iv) Providing appropriate personal protective equipment (PPE) in conjunction with training, use, and maintenance of the PPE; and
(v) Comply with: Child Labour (Prohibition and Regulation) Amendment Act, 2016; Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 as amended from time to time from appropriate authorities; Trade Unions Act, 1926; The Building and Other Construction Workers (Regulation of Employment and conditions of Service Act) 1996 and the Cess Act of 1996; The Factories Act, 1948; and Prohibition of Employment as Manual Scavengers and Their Rehabilitation Act 2013.

30. Following requirements of ADB SPS, PMO and RPMOs shall apply pollution prevention and control technologies and practices consistent with international good practice. When the Government of India regulations differ from these levels and measures, PMO shall achieve whichever is more stringent. Appendix 3, 4 and 5 provide applicable standards. If less stringent levels or measures are appropriate in view of specific subproject circumstances, PMO will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

B. Government Law and Policies

31. **Environmental Assessment.** The Government of India's EIA Notification of 2006 (replacing the EIA Notification of 1994), sets out the requirement for environmental assessment in India. This states that Environmental Clearance is required for specified activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts.

32. Category A projects requires environmental clearance from the Central Ministry of Environment, Forests and Climate Change (MOEFCC). The proponent is required to provide preliminary details of the project in the prescribed manner with all requisite details, after which an Expert Appraisal Committee (EAC) of the Ministry of Environment and Forest (MOEF) prepares comprehensive terms of reference (TOR) for the EIA study. On completion of the study and review of the report by the EAC, MOEF considers the recommendation of the EAC and provides the environmental clearance, if appropriate.

33. Category B projects require environmental clearance from the State Environment Impact Assessment Authority (SEIAA). The State level EAC categorizes the project as either B1 (requiring EIA study) or B2 (no EIA study), and prepares TOR for B1 projects within 60 days. On completion of the study and review of the report by the EAC, the SEIAA issues the Environmental Clearance based on the EAC recommendation. The Notification also provides that any project or activity classified as category B will be treated as category A if it is located in whole or in part within 10 km from the boundary of protected areas, notified areas or inter-state or international boundaries.

34. None of the components of this water supply improvement subproject in Udupi falls under the ambit of the EIA Notification 2006, and therefore Environmental Clearance is thus not required for the subproject.

35. **Environmental Rules, Laws, and Regulations.** Besides EIA Notification 2006, there are various other Acts, Rules, Policies and Regulations currently in force in India that deal with environmental issues that could apply to infrastructure development. These regulations are listed in Appendix 2. Table 3 below presents a summary of environmental regulations and mandatory requirements applicable to the subproject.

Table 3: Applicable Environmental Regulations

Law	Description	Requirement
Environmental Impact Assessment (EIA) Notification, 2006	The EIA Notification of 2006 sets out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. Projects are categorized as A or B depending on the scale of the project and the nature of its impacts. Category A projects requires Environmental Clearance from the Ministry of Environment and Forest (MOEF). Category B projects require Environmental Clearance from the State Environmental Impact Assessment Authority (SEIAA).	Subproject is not a listed activity in Schedule I of this notification and hence environmental clearance is not required.
Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Control of water pollution is achieved through administering conditions imposed in consent issued under provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quality and quantity of effluent, the location of discharge and the frequency of monitoring of effluents. Any component of the Project having the potential to generate sewage or trade effluent will come under the purview of this Act, its rules and amendments. Such projects have to obtain consent to establish (CTE) under Section 25 of the Act from	None of the components in this subproject requires CTE or CTO under this act.

Law	Description	Requirement
	Karnataka State Pollution Control Board (KSPCB) before starting implementation and consent to operate (CTO) before commissioning. The Water Act also requires the occupier of such projects to take measures for abating the possible pollution of receiving water bodies.	
Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982 and amendments.	The projects having potential to emit air pollutants into the atmosphere have to obtain CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from KSPCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	For the project, the following will require CTE and CTO from KSPCB: if, (i) diesel generators; (ii) hot mix plants; and (iii) stone crushers, installed for construction. All relevant forms, prescribed fees and procedures to obtain the CTE and CTO can be found in the KSPCB website (www.kspcb.gov.in).
Environment (Protection) Act, 1986 and CPCB Environmental Standards.	Emissions and discharges from the facilities to be created or refurbished or augmented shall comply with the notified standards notified.	Appendix 3 provides applicable standards for ambient air quality and noise. Appendix 4 provides standards for discharge of effluents Appendix 3 and 4 respectively also provides a comparison of national standards and internationally recognized guidelines with respect to ambient air and noise, and effluent discharge. ADB SPS requires adoption of stringent values for project implementation.
Noise Pollution (Regulation and Control) Rules, 2000 amended up to 2010.	Rule 3 of the Act specifies ambient air quality standards in respect of noise for different areas/zones.	Appendix 3 provides applicable noise standards.
Ancient Monuments and Archaeological Sites and Remains Act, 1958 and Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	The Amendment Act designates areas within 100 m from the “protected property” as “prohibited area” and beyond that up to 200 m as “regulated area” respectively. No “construction” is permitted in the “prohibited area” and any “construction” in the “regulated area” requires prior permission of the Archaeological Survey of India (ASI). “Protected property” includes the site, remains, and monuments protected by ASI or the State Department of Archaeology and “construction” means the construction of any structure or building.	There are no protected monuments near project area in Udupi. However, in case of chance finds, measures are suggested in Environmental Management Plan (EMP) to take prompt action to ensure its removal or protection in situ.

Law	Description	Requirement
Land Acquisition Act of 1894	Private land acquisition is guided by the provisions and procedures in this Act. The District Collector or any other officer designated will function as the Land Acquisition Officer on behalf of the Government. There is a provision for consent award to reduce the time for processing if the land owners are willing to agree on the price fixed by the Land Acquisition Officer.	For Udupi Water Supply Scheme seven sites are required, and all are government land.
Labor Laws	The contractor shall not make employment decisions based upon personal characteristics unrelated to job requirements. The contractor shall base the employment relationship upon equal opportunity and fair treatment, and shall not discriminate with respect to aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment or retirement, and discipline. The contractor shall provide equal wages and benefits to men and women for work of equal value or type.	Appendix 2 provides applicable labor laws including amendments issued from time to time applicable to establishments engaged in construction of civil works.
Biodiversity Act of 2002	The Biodiversity Act 2002 primarily addresses access to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the people.	Not applicable to Udupi Water Supply Scheme as no mentioned activities are involved in the project
Ramsar Convention, 1971	The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international co-operation for the conservation and wise use of wetlands and their resources. India is one of the signatories to the treaty. The Ramsar convention made it mandatory for the signatory countries to include wetland conservation in their national land use plans.	Not applicable to Udupi Water Supply Scheme as no wetlands presents in the project area.
Wildlife Protection Act, 1972	This overarching Act provides protection to wild animals, birds, plants and matters connected with habitat protection, processes to declare protected areas, regulation of wildlife trade, constitution of state and national board for wildlife, zoo authority, tiger conservation authority, penalty clauses and other important regulations.	Not applicable to Udupi Water Supply Scheme as none of the project component will have any impact on wildlife or protected areas.
Forest (Conservation) Act, 1980	The Forest (Conservation) Act prevents the use of forest land for non-forest	Not applicable to Udupi Water Supply Scheme as there is no

Law	Description	Requirement
	uses without the clearance from Ministry of Environment and Forests (MOEF), Government of India	forest area within or adjacent to the project area.
Indian Drinking Water Standards	Gives details of the permissible and desirable limits of various parameters in drinking water as per the Bureau of Indian Standards	Appendix 5 provides drinking water standards http://cgwb.gov.in/documents/wq-standards.pdf
Karnataka Forest Act, 1963 and Karnataka Forest Rules, 1969	This Act makes the basis for declaration of Reserved Forests, constitution of village forest committees, management of reserved forests and penalties and procedures.	Not applicable to Udupi Water Supply Scheme as there is no forest area within or adjacent to the project area.
Karnataka Preservation of Trees Act, 1976 and Karnataka Preservation of Trees Rules, 1977	This Act has put restriction on felling of trees in the State unless until permitted by the Tree Officer. Any person desiring to fell a tree shall apply in writing to the tree officer for permission in that behalf. It further defines clauses for planting adequate number of trees, planting in place of fallen/destroyed trees, preservation of trees and adoption of trees.	At one OHT site, there are 10 Trees, which needs to be cut. Compensatory plantation as stipulated in the tree cutting permission shall be adhered
Coastal Regulation Zone Notification - Ministry of Environment and Forests	This notification declared coastal stretches as Coastal Regulation Zone (CRZ) and restricts new construction, and industrial activities in the CRZ (landward side) include the following: (i) land area from High Tide Line (HTL) to 500 m on the landward side on the sea front, (ii) land area between HTL to 100 m or width of creek whichever is less on the landward side along the tidal influenced water bodies connected to sea, and (iii) land area between HTL and LTL. Notification defines CRZ in I. II, III, IV Categories based on the environmental sensitivity and existing development. The “developed area” within existing municipal limits or in other existing legally designated urban areas which are substantially built-up and has been provided with drainage and approach roads and other infrastructural facilities, such as water supply and sewerage mains are defined as CRZ II.	Per the current subproject locations, none of the components are located in the CRZ. If any component falls in CRZ during implementation, permission / No Objection Certificate (NOC) will be obtained from the Karnataka Coastal Zone Management Authority (KCZMA) prior to start of work.

36. **Clearance Requirements of Bulk Water Components Proposed under Government Funding**. Environmental clearance requirement per Government of India Environmental Impact Assessment Act and its notifications are not applicable to this subproject. No environment-related statutory clearance or permissions required for ADB-funded components. The government-

funded bulk water intake will require permission from Irrigation and while the WTP will require clearance from the Forest Department.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Environmental Profile of Udupi

1. Location

37. Udupi is located in Udupi District. Geographically, Udupi is located at a latitude of 13°33′ N and longitude of 74°74' E. Udupi has the status of CMC. The City is divided into 35 wards and spreading to an area of 69.28 km^2. Udupi lies in Seismic Zone-III as per IS 1893-2002.

2. Topography, Soil and Geology

38. The coastal district Udupi of Karnataka state falls along the west coast of peninsular India and is separated from the rest of peninsula by towering high Western Ghats. The district lies between 13º04' and 13º59' North latitude and 74º35' and 75º12' East longitude covering an area of 3,575 km^2. It is about 88 km in length and about 80 km in widest part and is bounded by Uttara Kannada district in the North, by Shimoga and Chikamagalur district in the East and by Dakshina Kannada district in the South. The district is carved out of South Canara District during 1991. The district comprises administrative subdivisions Coondapur, Udupi and Karkala Taluks.

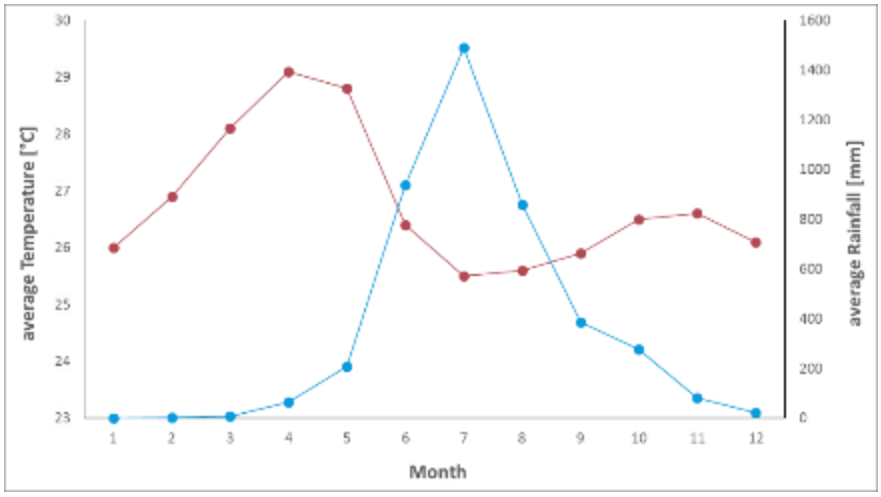
39. This coastal agro climatic west flow river basin is characterized by maritime climate. It covers parts of Mulki, Shirva, Swarna Yennehole, Madisala, Sita, Haladi, Chakravani, Kollur, Baindur and Sankadagudi hole sub basins. These rivers are perennial during normal rainfall years where as tributaries and smaller streams become dry during summer. The prevailing high gradient in the hilly terrain and heavy rainfall brings great volume of water in these rivers during monsoon.

40. There is no any major irrigation scheme in Udupi district. The minor irrigation schemes include both surface water and ground water schemes. The ground water schemes consist of Dug wells, Shallow and Deep tube wells, while surface water schemes include surface flow (tanks, anicuts, pick-ups, barrages) and lift irrigation schemes. Lift irrigation is the major irrigation practice. Water management practices like sprinkler irrigation is taking popularity in Udupi district.

3. Climate

41. The climate in Udupi is hot in summers and pretty comfortable in winter. During summers (from March to May) the temperature reaches up to 40°C and in winters (from December to February) it is usually between 32°C and 20°C. The monsoon period is from June to September with one of the rainfall averaging more than 4000mm every year and heavy winds. The average temperature and rainfall in Udupi is presented in the below Figure 9.

Figure 9: Average Temperature and Rainfall in Udupi



Source: Climate data.org, 2015.

42. The yearly mean temperature is 31.58°C and the total yearly rainfall comes up to 4,096.90 mm (Climate data.org, 2015). The construction schedule has considered the same for effective implementation.

4. Earthquake

43. Udupi lies in Seismic Zone-III as per IS 1893-2002. This zone is classified as Moderate Damage Risk Zone.

5. Physiographic

44. **Karnataka Coastal Region.** The Karnataka Coastal Region, which extends between the Western Ghats edge of the Karnataka Plateau in the east and the Arabian Sea in the west, covers Dakshina Kannada, Udupi and Uttara Kannada districts. This region is traversed by several ridges and spurs of Western Ghats. It has difficult terrain full of rivers, creeks, waterfalls, peaks and ranges of hills. The coastal region consists of two broad physical units, the plains and the Western Ghats. The coastal plains represent a narrow stretch of estuarine and marine plains. The abrupt rise at the eastern flanks forms the Western Ghats. The northern parts of the Ghats are of lower elevation [450 meters (m) to 600 m] as compared to Southern parts (900 m to 1,500 m). The coastal belt with an average width of 50 m to 80 km covers a distance of about 267 km from north to south. At certain places, the crest of adjoining Western Ghats reach the sea as close as 13 km near Karwar. The average height is generally 75 m from the mean sea level (msl). Although Udupi is a coastal town, none of the proposed subproject components are located in the coastal regulation zone.

6. Geomorphology and Soil

45. The district comprises of three distinct physiographic units viz., (i) narrow stretch of coastal tract, (ii) up land area, (iii) the hilly terrain. The coastal areas exhibit coastal beach, spits and creeks and backwater swamps with the surface features of sandy strips and linear troughs. The coastal parallel troughs are seen around Parampalli, Kota and Manur. The area adjoining the coastal stretch exhibits forested high hilly topography with deep valleys. Most part of the district is rugged terrain and demarcates areas with slopes of less than 2%, 2% to 5% and more than 5%. About 50.68% of the district falls under 2% to 5% slope and remaining fall under more than 5% slope. Most part of Lateritic capped pediplains have an elevation ranging from 40 m to 60 m above msl. which is an important physiographic feature. Upland pediplain area intercepted with low hills between Western Ghats and the coast, which is moderately cultivated. Western ghats and forested area located on the eastern part of the district.

46. **Soil Type.** The district is covered with three types of soils (i) sandy soil covering the beaches and the adjoining stretches, (ii) yellow loamy soil, and (iii) red lateritic soil. The sandy soils are confined to a narrow strip of the coast having width ranging from less than 100 m to as much as a kilometer. These fine to medium texture sands are characterized by their extremely high rate of infiltration and act as a good recharge media for ground water. Yellow loamy soils are transported from origin and are found mostly along riverbanks and lower reaches of valleys. They are mostly used for tile industries. This soil type is very well suited for irrigation and shows good response to irrigation practices. Red lateritic soil is the most dominant soil type in the area. The texture of these soils varies from fine to coarse. The soil in the valleys and immediate slopes are rich in loam where as in upper slopes and pediplains are much coarser in nature. The degree of leaching undergone by this soil type is also variable.

7. Air Quality

47. There is no data on ambient air quality in Udupi, which is not subject to monitoring by the Karnataka State Pollution Control Board (KSPCB). Located close to coast with no major air polluting sources, generally the air quality in the area is good. Traffic is the only significant source of pollutant, so levels of oxides of sulfur and nitrogen are likely to be well within the National Ambient Air Quality Standards (NAAQS). No field monitoring (environmental) survey was conducted during preparation of this IEE. However, the EMP includes an environmental monitoring program which will require the contractors to establish the baseline environmental conditions prior to commencement of civil works. The results will be reported as part of the environmental monitoring report and will be the basis to ensure no degradation will happen during subproject implementation.

8. Surface Water

48. There is only River Swarna in and around the city. This river is non-perennial. In summer season for four months there is no inflow in the river. River Varahi, flowing at about 37 km in northeast direction of Udupi, is a perennial river. Water quality monitoring of River Swarna is KSPCB and the water quality is classified as category C “Drinking water source after conventional treatment and disinfection”. Table 4 shows the water quality of the river near existing intake location.

Table 4: Water Quality of Swarna River – Samples Taken at the Intake Point
(Date of Sampling: 27 February 2015)

NAME OF THE INDUSTRY :	M/s CMC, Udupi.
SAMPLE COLLECTED BY :	AEO, Udupi
DATE OF COLLECTION :	27.02.2015
DATE OF RECEIPT :	27.02.2015
SAMPLE NO &PARTICULARS OF SAMPLE COLLECTED:	1.Water Sample Collected at Intake point Hiriyadka(1091) 2.Water Sample Collected at outlet of Treatment Plant(1092)

Sl No.	Parameters Analysed	Unit	Standard		Results	
			*DL	**PL	Sample No.1091	Sample No.1092
1	pH	pH unit	6.5 -8.5	6.5 - 8.5	7.1	7.2
2	Hardness as $CaCO_3$	mg/L	300	600	14	20
3	Calcium as Ca	mg/L	75	200	4	3
4	Magnesium as Mg	mg/L	30	100	1	3
5	Chloride	mg/L	250	1000	16	16
6	Sulphate	mg/L	200	400	1	1
7	Fluoride as F	mg/L	1	1.5	0.05	0.04
8	Total Dissolved solids	mg/L	500	2000	96	84
9	Iron as Fe	mg/L	0.3	1	BDL	BDL
10	Nitrate as NO_3	mg/L	45	45	0.5	0.4

9. Groundwater

44. In general, the quality of ground water at certain depths in the sandy aquifer are found good and potable and in the adjoining areas covered by lateritic/weathered gneissic rocks, it is sweet to alkaline. The dug wells in the alluvial area generally yield saline water during summer months and get fresh water during monsoon periods. The water samples collected from the dug wells /shallower zones during May 2006 indicate the electrical conductivity value as 500 to 10,430 microgram per centimeter (µ/cm) at 25°C in the higher order and 200 µ/cm to 500 µ/cm in the lower order. The electrical conductivity in some of the deeper bore well located at places recorded as high as 18,830 µ/cm at 25°C is saline. Some parts of Udupi and Kundapura taluks have chloride concentration up to 4,000 milligrams per liter (mg/l). Some groundwater in the area is contaminated from the salinity of tidal recharge. This contamination is more pronounced in wells along the stream courses up to the distance where tidal effect extends. Further, Ground water in proximity to stream course is contaminated with seepage of domestic waste. As a general rule, groundwater withdrawal must be distributed in time and space and there should not be any concentration of wells to avoid saline water ingress.

Table 5: Groundwater Development in Udupi

Particulars	Details (ha m)
Net annual ground water availability	15073
Existing gross ground water draft for Irrigation	17088
Existing gross ground water draft for Domestic and Industrial Water supply	833
Existing gross ground water draft for all uses	19711
Allocation for domestic and industrial use for next 25 years	3712
Net ground water availability for future irrigation development	29590
Balance ground water irrigation potential available (ha)	50389

Source: Central Ground Water Board Report, December 2008.

10. Industry and Agriculture

49. Udupi region main activity is agriculture with paddy, coconut, areca nut (Areca catechu), and cashew are main crops. Rubber plantations and other commercial crops like sugarcane,

ground nut are also undertaken in certain parts of the taluk. Udupi imports clay and manufactures Tiles and bricks. There are agro based units for paddy (rice), areca nut and tobacco processing. There is a port at the confluence of Panchagangolli river. Even though National Highway (NH) 17 and Konkan railway pass near this port, development of this port has not taken place. This port is considered mainly for fishing. The Department of Fisheries has proposed to take up new projects like a fish landing centre at Koderi in Udupitaluk, open type fishing harbour at Maravanthe, construction of breakwater at Shirur- Alvegadde, Gangolli, construction of jetty at Udupi Kodi, extension of the wharf at Alvekodi and improvements at Thenginagundi fish landing centres. These projects would be fully-funded from the state government funds.

11. Transportation

50. NH 66 passes through Udupi. Other significant roads include the State Highways to Karkala and Dharmastala and to Sringeri. The NH 66 provides a link to Mangalore and Karwar via Kundapur. Private as well as government buses connect Udupi to parts of Karnataka. Udupi has a railway station on the Konkan Railway. The nearest International Airport to Udupi is Mangalore International Airport, which is 50 km away. City and suburban transport is available for travel within Udupi and suburbs. The buses originate from the suburban bus stand (City Bus Stand). There are different route numbers. The nearest harbor/port to Udupi is Malpe, which is 5 km away, and Gangolli (Byndoor), which is 36 km away. The New Mangalore Port is 50 km away from Udupi. Udupi railway station is managed by the Konkan Railways. It is about 4 km from Udupi and is on the Kanyakumari-Mumbai rail route. Direct trains are available to Bengaluru, Mumbai, New Delhi, Amritsar, Chandighar, Pune, Ajmer, Jaipur, Rajkot, Ahmedabad, Okha. Cities like Mysore, Belgaum, Jodhpur, Agra, Thiruvananthapuram, Ernakulam, Kollam (Quilon) etc. also connected with Udupi. Konkan has a beautiful scenic view throughout its way.

B. Socio Cultural Resources

1. Demography

51. As of the 2011 India census, Udupi had a population of 165,401. Males constituted 51% of the population and females 49%. The average literacy rate was 93.89%, higher than the national average of 59.5%; male literacy was 86% and female literacy 81%. Eight percent of the population was under 6 years of age. Udupi, which previously had a City Municipal Council now has a City Municipal Council which came into existence in 1995. Areas around Udupi, such as Manipal, Parkala, Malpe, Udyavara and Santhekatte were merged to form the City Municipal Council. Udupi was carved out as a separate district from the erstwhile Dakshina Kannada district on 25 August 1997. Udupi, Kundapura and Karkala were bifurcated from the Dakshina Kannada District and the Udupi District was formed. Savita S. Kotian and Prakash T. Mendon of the Bharatiya Janata Party (BJP) are the current president and vice-president of the Udupi Zilla Panchayat, after the election held at the Zilla Panchayat on 7 August 2014. Tulu is the most widely spoken language in Udupi. Other languages spoken here include Konkani and Kannada. Muslims in Udupi speak Urdu Nawayathi and Beary Bashe.

52. **Sex Ratio.** In Udupi Municipal Council, Female Sex Ratio is of 1022 against state average of 973. Moreover, child sex ratio in Udupi is around 927, as compared to Karnataka state which has an average of 948.

53. **Literacy.** Literacy rate of Udupi City is 93.55 % higher than state average of 75.36 %. In Udupi, male literacy is around 95.94%, while female literacy rate is 91.22%.

2. History, Culture and Tourism

54. Udupi is notable for the Krishna Temple, Tulu Ashtamathas. is also known as Lord Parashurama Kshetra, and is famous for Kanakana Kindi. Udupi in Tulu, alternatively spelled as Udipi, also known as Odipu, is a city in the Indian state of Karnataka. A center of pilgrimage, Udupi is known as Rajata Peetha and Shivalli (Shivabelle). It is also known as the temple town. Bhuta Kola, Aati kalenja, Karangolu, and Nagaradhane are some cultural traditions of Udupi. The residents celebrate festivals such as Makara Sankranti, Krishna Janmashtami, Navaratri, Deepavali, Eid al-Adha, Eid al-Fitr and Christmas. Folk arts like Yakshagana are also popular. Rathabeedhi Geleyaru and Kalavrinda are local non-profit organizations, founded to encourage creative pursuits, especially those that keep alive the traditions of the region. Its primary focus has been historic dramas.

55. During the biennial Paryaya festival, the temple management is handed over to the next Matha. Each of the Ashtamathas (eight mathas) is headed by a Swami, who will be in charge of the pooja or worship of Lord Krishna, not to mention, the temple, during his 'Paryaya'. The Paryaya ceremony is held on 18 January on even years (like 2012, 2014 and so on), starting early in the morning at around 3 AM. During this festival there are representative tableau which gather near the entrance of the City (called 'Swagata Gopura' meaning the arc of welcome). Festivals like Makara Sankranti (the day the idol's prathisha was done), Ratha Sapthami, Madhwa Navami (the day on which the Acharya Madhwa disappeared while he was teaching his disciples, the exact place of which is still marked and visited by devotees, near the matha), Madhwa Jayanti (the birthday of the great saint Madhwacharya), Vijaya Dashami, Hanuma Jayanthi, Sri Krishna Janmashtami, Navaratri Mahotsava, Naraka Chathurdashi, Deepavali, Geetha Jayanthi, Daasara aradhanas, etc. are celebrated with grandiosity by the Paryaya Mutt every year.

56. Krishna Janmashtami is celebrated every year. During this festival groups of men wear 'Pili Vesha' (in Tulu; Huli vesha in Kannada), which literally means 'tiger costume'. They visit houses and shops around Udupi, to perform a rather unusual dance. There is a lot of enthusiasm among the participants and public.A yet another signature celebration is the Bhajana Saptaha Mahotsava, held in Sri Laxmi Venkatesha Temple, by the Goud Saraswat community. 'Saptaha' means 7 days and throughout these 7 days, Bhajans are sung, day and night by devotees. This event takes place every year during the month of August, starting from Nagara Panchami till the next Dwadashi. Rathothsava (Chariot Festival) is held in almost all occasions around Rathabeedi. A ratha (chariot) carries a 'utsava moorthi' of Lord Krishna. This chariot is pulled by devotees around Rathabeedi. Though, Rathothsava is common in the Hindu form of worshiping, Udupi is known for the multiplicity and beauty of the chariots and festivals. However, there are no protected monuments of History, culture, tourism.

C. Environmental Settings of KIUWMIP Tranche 2 Component Sites

57. There are no environmentally-sensitive feature and no significant physical and cultural resources within or adjacent to the subproject sites. All the OHT sites selected are on government-owned vacant land parcels, and all the pipelines are proposed along the roads, where there is space along the ROW to lay the pipeline. There are few trees of local species in some OHT sites, which needs to be removed for the construction. There are no trees in the proposed pipeline alignment along the roads. Photographs of proposed OHT sites are provided in Tables 6, 7, and 8, respectively which show alignment of distribution and feeder main pipelines.

Table 6: Photographs of Proposed Sites

OHT Site at Manipal for Zone-3

OHT Site at Manapalla lake for Zone-5

Proposed OHT Site at Manchi for Zone-6B

Proposed OHT Site Near Ammani Ramanna Shetty hall, Kolambe Zone-7C

Proposed OHT Site at Kakkunje for Zone-8B

Proposed OHT Site at Indrali for Zone-8C

Proposed OHT Site at Santhekatte for Zone-9B

Table 7: Photographs Showing Distribution Pipeline Alignment along the Roads

 110 mm dia HDPE pipe Parkala Market road near Parkala Primary School. Road Width 9.5 m	 110 mm dia HDPE pipe Herga temple road. Road Width 5.5 m
 110 mm dia HDPE pipe Herga temple 1st cross road. Road Width 4.5 m	 110 mm dia HDPE pipe Herga temple 2nd cross road. Road Width 4.5 m
 110 mm dia HDPE pipe Golikatte road. Road Width 4.0 m	 110 dia HDPE pipe Kattingere road.Road width 4.0 m
	

110 mm dia HDPE pipe. Opp. Government High School Herga. Road width 3.5 m	110 mm dia pipe. Sheshadri road. Road width 3.5 m
	
110 mm dia HDPE pipe. Kodange- Tulaja Bhavani Devi Katte road. Road width 3.5 m	110 mm dia HDPE pipe. Sarlebettu Bhajana Mandir road. Road width 3.5 m
	
110 mm dia HDPE pipe. Sarlebettu Manipal End Point road. Road width 3.5 m	150 mm dia HDPE pipe. Manipal Alevoor road near Twin GLSR. Road width 9.5 m
	
150 mm and 110 mm dia HDPE pipe. Mannampalla lake road. Road width 4.5 m	200 mm and dia HDPE pipe. Manipal main road Near Syndicate Bank circle. Road width 16 m (Double road)

110 mm HDPE pipe. Vidyarathna Nagara near sathkar Paradise Manipal . Road width 4.0 m

110 mm HDPE pipe. Vidyarathna Nagara cross road. Road width 3.5 m

110 mm HDPE pipe. Sagrinagabrahmasthana road. Road width 3.0 m

110 mm HDPE pipe. Sagrinole 2nd cross road. Road width 3.5 m

350 mm HDPE pipe. Gundibail Manipal Road. Road width 4.5 m

160 mm dia HDPE pipe.KK Hospital Road Doddannagudde.Road width 4.25 m

110 mm HDPE pipe. V. M Nagar Road. Road width 4.5 m

300 mm HDPE pipe. Near Indrali bridge in Udupi- Manipal Road. Road width 7.5 m

300 mm HDPE pipe. Kalsanka junction in Udupi-Manipal road. Road width 18 m (Double road)

300 mm HDPE pipe. Maruti Vithika Road Udupi. Road width 9.0 m

300 mm HDPE pipe. Poornaprajna Road Udupi. Road width 4.0 m

300 mm HDPE pipe. Lambard Memorial Road Udupi. Road width 5.25 m

300 mm HDPE pipe. Kolambe Road Udupi. Road width 5.5 m

300 mm HDPE pipe. Chitpadi- Beedinagudde Road Udupi. Road width 4.0 m

300 mm HDPE pipe. Kolambe Road Udupi. Road width 3.0 m

300 mm HDPE pipe. Bhujanga Rao Road Udupi. Road width 3.5 m

300 mm HDPE pipe. Sharada Kalyan Mantap Road Udupi. Road width 5.5 m

300 mm HDPE pipe. Circute House Road near S. P office Udupi. Road width 5.75 m

350 mm HDPE pipe. Vishveshwarayya road Udupi. Road width 4.25 m

350 mm HDPE pipe. NH 66 Service road Udupi. Road width 4.5 m

350 mm HDPE pipe. Convent road Udupi. Road width 8.0 m

110 mm HDPE pipe. NH 66 road near Hyndui show room Udupi. Road width 12.0 m

350 mm dia HDPE pipe. Kalyanpura road Udupi. Road width 7.25 m

350 mm and 110 mm dia HDPE pipe. Santhekatte NH 66 Service road Udupi. Road width 5.0 m

350 mm dia HDPE pipe. Malpe road. Road width 5.75 m

350 mm dia HDPE pipe. Infront of Canara Equipments Malpe road. Road width 5.0 m

350 mm and 110 mm dia HDPE pipe. Kodavuru road. Road width 5.5 m

350 mm dia HDPE pipe. Mudubettu road. Road width 4.5 m

200 mm dia HDPE pipe. Malpe- Udupi road. Road width 7.25 m

110 mm dia HDPE pipe. Diana- Kukkikatte road. Road width 6.5 m

300 mm dia HDPE pipe. Manchi Mulasthana road. Road width 3.0 m	300 mm dia HDPE pipe. Vyvahar Garden road. Road width 5.0 m

Table 8: Photographs of Clear Water Feeder Main Pipeline Alignment

 150 mm dia DI- K9 pipe for Zone- 5 OHT. HUDCO colony road. Road width 6.25 m	 150 mm dia DI- K9 pipe for Zone-5 OHT. HUDCO colony road. Road width 6.25 m
 273.1 mm dia MS pipe Diana- Kukkikatte road. Road width 6.5 m	 273.1 mm dia MS pipe. Kukkikatte- Manchi Mulasthan road. Road width 6.25 m
 323.9 mm dia MS pipe. Kakkunje Road. Road width 4.75 m	 323.9 mm dia MS pipe. Kakkunje High School cross road. Road width 4.75 m
 355.6 mm dia MS pipe. Puttur Sri Durgaparameshwari temple road Udupi. Road width 5.75 m	 355.6 mm dia MS pipe. NH 66 Service road Santhekatte Udupi. Road width 5.75 m

V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

58. Potential environmental impacts of the proposed infrastructure components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact further.

59. As a general practice, an IEE should evaluate impacts due to the pre-construction (location, design), construction and operation phases of the project. Construction and operation are the two activities in which the project interacts physically with the environment, so they are the two activities during which the environmental impacts occur. In assessing the effects of these processes therefore, all potential impacts of the project should be identified, and mitigation is devised for any negative impacts. Following sections evaluate impacts of the proposed Udupi Water Supply Subproject to be funded under KIUWMIP Tranche 2.

(i) **Location Impacts**. There are no environmentally-sensitive feature and no significant physical and cultural resources within or adjacent to the subproject sites. All the OHT sites selected are on government-owned vacant land parcels, and all the pipelines are proposed along the roads, where there is space along the ROW to lay the pipeline. There are no trees in the alignment.

(ii) **Design Impact.** Includes impacts arising from technology used and method for pipelaying works and construction of OHTs.

(iii) **Construction Impacts.** Includes impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.

(iv) **O&M Impacts.** Include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams and occupational health and safety issues.

B. Pre-Construction Impact

60. **Location.** These Impacts are associated with planning particularly on the site selection. They include impacts due to encroaching on sensitive areas and impacts on the people who might lose their homes or livelihoods due to the development of the proposed site. In case of water supply lines, no significant impacts are anticipated since the laying of water line will be along the already built up area. All the sites for OHT are proposed in government land and there is no need to procure any private land.

61. Proposed subproject sites are carefully selected to avoid encroachment into sensitive areas and minimize the impacts on people livelihoods and homestead. In the case of this project (i) most of the individual elements are relatively small and involve straight forward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being located in the urban areas, will not cause direct impact on biodiversity values.

62. **Tree Cutting at Project Sites**. All sites are carefully selected, and layouts designed to minimize the tree cutting. Some of the subproject sites (OHTs) have trees, which need to be cut for project construction. Pipelines are proposed along the roads, at some places there are trees,

however, no tree cutting is envisaged for laying pipelines. Following measures need to be implemented to minimize and/or compensate for the loss of tree cover:

(i) Further minimize removal of trees, if possible, by adopting to site condition and with appropriate layout design (OHT sites) and alignments (for pipelines);
(ii) For any tree cutting that may be required, obtain prior permission from Forest Department; and
(iii) Plant and maintain 10 trees for each tree that is removed.

63. The Udupi CMC should obtain all necessary clearances before the starting of the work. Pipelines crosses national highways, railways, at various locations as given below, which require permission from respective agencies.

(i) At Indrali Railway over Bridge Chainage in between 690/8 and 690/9 , 300 mm dia distribution line HDPE pipe passing for 30 m length.
(ii) At Kukkikatte Railway over bridge chainage in between 693/2 and 693/3, 273.1 mm dia MS clear water transmission main passing for 35 m span.
(iii) At Korangrapadi Alevoor railway over bridge chainage in between 693/7 and 693/8, 110 mm dia rider line passing for 37 m span.
(iv) In NH-66, 110 mm dia for 4,365 m, 150mm dia en-route village to Udyavara for 120 m, to Kadekar village for 220 m, 350 mm dia DI pipe for 435 m, 355.6 mm dia MS pipe for 2,145 m.
(v) In NH-169A, 110 mm dia rider line for 855 m, 160 mm dia HDPE pipe for 677 m, 200 mm dia for 805 m, 250 mm dia for 250 m, 300 mm dia for 2,136 m, 150 mm dia DI pumping main for 230 m.
(vi) SH-37, 110 mm dia 410 m, 273.1 mm dia gravity transmission main for 1,156 m and 150 mm dia for 368 m.

64. **Utilities.** During the installation stage of water lines, traffic and human activities like telephone lines, electric poles and wires, water lines within the proposed subproject locations may require to be shifted in few cases which will be temporarily interfered due to the operation of construction machineries. To mitigate the impacts due to relocation of the utilities, PIU will:

(i) Identify and include locations and operators of these utilities in the detailed design documents during design validation phase and preconstruction phase to prevent unnecessary disruption of services during construction phase;
(ii) Conduct detailed site surveys with the construction drawings and discuss with the respective agencies during the construction phase before ground clearance; and
(iii) Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. In case of disruption of water supply, alternative supply, through tankers, shall be provided.

65. **Site Selection of Construction Work Camps, Stockpile Areas, Storage Areas, and Disposal Areas**. If the work camp is planning to set up, priority is to locate these near the subproject locations. However, if it is deemed necessary to locate elsewhere, sites to be considered will not result in destruction of property, vegetation, irrigation, and drinking water supply systems. Residential areas will not be considered for setting up camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near the forest, water bodies, swamps, or in areas which will inconvenience the community. All locations would be included in the design specifications and on

plan drawings. Construction work camps shall be located at least 200 m from residential areas. Material stockpiles shall be protected by bunds during the monsoon to arrest the silt laden runoff into drains. The subproject is likely to generate soil from excavations, which needs to be disposed safely. The following measures should be considered for disposal of surplus/waste soil:

(i) The excavated soil should be removed from construction area at the earliest for beneficial reuse such as land raising / filling of excavated areas.
(ii) Soil should be covered with tarpaulin sheets during the transportation.
(iii) Soil transportation should not be done during the peak hours and should be avoid narrow and heavy traffic routes and important religious or tourist sites.

66. **Site Selection of Sources of Materials.** Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution. To mitigate the potential environmental impacts, locations of quarry site/s and borrow pit/s (for loose material other than stones) would be included in the design specifications and on plan drawings. Priority would be sites already permitted by Mines and Geology Department. If other sites are necessary, these would to be located away from population centres, drinking water intakes and streams, cultivable lands, and natural drainage systems; and in structurally stable areas even if some distance from construction activities.

67. For Udupi subproject, the quarry material required will be sand and stone aggregate, and the nearest quarries are near Karkala for stone aggregate. These are existing quarries and are licensed by Mines and Geology Department. The material from the existing quarries will be adequate for the subproject construction, and therefore no new quarry sites will be developed for the purpose.

C. Design Impact

68. These impacts arise from the design of the investment program, including technology used and method for pipe laying works and construction of OHTs.

69. **Design of the Proposed Components.** The Central Public Health and Environmental Engineering Organization (CPHEEO) manual suggests a design period of 30 years in general while designing the system for water supply components. Since, the packages are proposed to be implemented sequentially; theoretically, each of the system components should have a different design year. However, in order to maintain unanimity in the design period and design population, 2046 has been considered as the design year for all the system components. Accordingly, 2016 is the base year and 2031 the intermediate year to cross check the designs pertaining to intermediate demand. The rate of supply has been taken as 135 lpcd for 100%population.

70. **Distribution System Design**. Owning to topography, and residual pressure requirements at consumers ends, a pumping in the system cannot be avoided. Treated water will be pumped to OHTs and from there water will flow under gravity system to consumers. No design specific impacts envisaged.

71. The proposed distribution system will partially depend on the proposed bulk water supply project proposed under the government-funded project. If the project is unable to deliver water, the envisaged benefits of distribution system will not be realized fully. Due diligence of components of bulk water project discussed below.

D. Due Diligence of Government-Funded Components

72. As discussed in the previous chapters, a bulk water supply project with government funding (AMRUT) is also proposed in parallel with the distribution system improvement subproject under KIUWMIP Tranche 2 to comprehensively improve the water supply system in Udupi. The AMRUT-funded bulk water supply project will create a new source to provide adequate quantity of water throughout year.

73. As KIUWMIP Tranche 2-funded distribution network system will partially depend on this bulk water supply project. The main components proposed in the government-funded bulk water project include construction of jackwell cum pump house in Varhahi River, raw water pumping mains, construction of WTP and clear water main. Statutory clearance requirements, source sustainability, and environmental performance of existing WTP are presented below:

1. Statutory Clearance Requirements

74. Environmental clearance requirement per Government of India's EIA Notification, 2006, is applicable to none of the project components proposed under the government-funded bulk water project. In Karnataka, WTPs do not require permit/consent from Karnataka State Pollution Control Board (KSPCB) either to establish or operate under the current legislations. Water abstraction and construction of jackwell require permission of Irrigation Department, and the proposed WTP site, which is located adjacent to existing WTP, is a notified forest land, therefore requires permission from forest department. These permissions need to be obtained prior to start of construction. No other environmental related clearance or permissions required.

2. Source Sustainability

75. At present, River Swarna is the main source of water supply of Udupi, and under the government-funded bulk water supply project, it is proposed develop an additional source (River Varahi) because the flow in River Swarna is very low during summer season (available only for duration of 101 days from February to May. The proposed new source, together with the existing, will ensure adequate water supply for Udupi throughout the year. The Varahi Hydal Power Project (VHPP) and an irrigation weir is located on the upstream site of proposed intake. VHPP discharges 1,100 cusec of water into river course throughout year, of which 800 cusec is for irrigation use and remaining 300 cusec is available for drinking and river flow purposes. It is proposed utilize this available source mainly for the summer season to augment the water coming from River Swarna. At present, Kundapura is the only major town in the downstream of the proposed Udupi intake. Kundapura is also utilizing River Varahi with a total demand of 7.6 MLD or 3.9 cusec. With Udupi's design demand of 48 MLD or 20 cusec, the combined demand of the two towns is 23.9 cusec or 7.97% of the available flow. Thus 92% of remaining flow or 74 cusec will be available for downstream users. Therefore, there are no significant impacts related to source sustainability or downstream impacts.

76. **River Water Quality.** There are no major pollution sources like industries in the upstream side of the intake. Most of the villages and towns, however, along the river discharge domestic wastewater into the river without any treatment, although there is no such disposal point in the proximity of intake. A grab sample was collected from the intake and tested for quality. The raw water will be treated in the proposed WTP to drinking water standards and supplied to the consumers.

3. Environmental Audit of Water Treatment Plants (WTP)

77. At present, a 27 MLD WTP is under operation in Udupi. This was constructed in 2006 under the ADB funded KUDCEM Project. Existing WTP is operated and maintained by Udupi CMC. Besides, under the bulk water project, an additional 30 MLD WTP will be constructed adjacent to the existing WTP. There is another old WTP, which is also located in the same campus, is old and non-functional. Environmental audit of existing WTP is conducted (Environmental Audit report is presented in Appendix 11) during IEE preparation to assess the current environmental performance and identify issues of concern.

78. The audit identified some concerns which need to be addressed. At present, no backwash and sludge collection, treatment or disposal systems available at the existing WTP. Backwash along with sludge accumulated at different WTP units is disposed into open drains, which will join the natural water bodies. Under the bulk water project, a 30 MLD capacity WTP is proposed to be constructed. Water treatment process will generate sludge from sedimentation of particulate matter in raw water, flocculated and precipitated material resulting from chemical coagulation, residuals of excess chemical dosage, plankton, and waste from rinsing and back washing of filter media containing debris, chemical precipitates, straining of organic debris and plankton. At present chlorination system is also not proper and lacks any proper safety measures. Therefore it is important that the proper management and disposal of backwash and sludge generated from the existing and proposed WTPs, and safety in handling and application of chlorine is ensured. An action plan is suggested in the following Table 9 to ensure the compliance:

Table 9: Corrective Action Plan for Environmental Compliance of Water Treatment Plants

Concern	Action Required	Timeline	Responsible Agency and Funding Source
Poor backwash wastewater and sludge management – discharged untreated into natural drains	- Provision of backwash recirculation system – to avoid discharge and also to recover raw water -Provision of sludge collection, thickening, drying and reuse/disposal system	Corrective actions such as treatment of backwash water and sludge management system are included in the bulk water project	Udupi CMC / Government of Karnataka. This component is already included in the bulk water project. It is proposed to develop combined backwash recirculation and sludge management facilities for both the existing and new WTPs under the bulk water project.
Poor handling of chlorination system and lack of safety measures	Improvements to chlorination already included in the subproject.	Same as above	Udupi CMC / Government of Karnataka. This component is already included in the bulk water project. It is proposed to develop proper chlorination system, with all safety measures for both the existing and new WTPs under the bulk water project.

79. **Social and Cultural Resources – Chance Finds.** Any work involving ground disturbance can uncover and damage archaeological and historical remains. Subproject area is not a known area of archaeological potential, and therefore the risk is low. Nevertheless, construction contractor needs to follow these measures in conducting any excavation work:

(i) Create awareness among the workers and supervisors about the chance finds during excavation work;
(ii) Stop work immediately if any finds are suspected to allow further investigation; and
(iii) Inform archaeological agencies promptly if a find is suspected, and take any action they require to ensure its removal or protection in situ.

E. Construction Impact

80. **Construction Method for Pipelaying Works.** The civil works for pipeline network projects include earthwork excavation trenches, pipe laying, installing valves, flow meters and data loggers, shifting of public utilities (if required) and providing house connections. Earthwork excavation will be undertaken by machine and include danger lighting and using sight rails and boning rods at every 100 m, while pipe laying works will include laying pipes at required gradient, fixing collars, elbows, tees, bends and other fittings including conveying the material to work spot and testing for water tightness.

81. The excavation is done in such a way that there will be a minimum depth of one meter. Sufficient care will be taken while laying, so that existing utilities and cables are not damaged, and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. Once they are laid, pipes will be joined as per specification and then tested for any cracks of leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features.

82. **Construction Method for Overhead Tanks.** Excavation will be done as per the execution drawing for excavation by adopting standard procedures by using excavators. Excavation will be carried out in methodical manner by providing proper approach roads with adequate slopes for machinery movement. Wherever the excavation is not possible by machines – manual excavation by workmen will be carried out.

83. Consolidation will be carried out by knowing the exact geo-technical characteristics of the site. Compaction and consolidation of earth will be carried out up to the desired level of consolidation by adopting standard procedures. The necessary compaction test will be conducted. Before carrying out any concreting works necessary approval of client/consultant in the pour card will be obtained. Bill of materials and Bar bending schedules as per the approved drawings will be prepared and kept ready.

84. The shuttering plates of proper sizes with proper finish or new plywood (waterproof) of adequate thickness will be used along with scaffolding pipes and clamps

85. At the time of placing concrete at every stage required test cubes will be taken and it will be kept under proper curing. These cubes will be tested in the site laboratory in the presence of client/consultant on 7/14/28 days sampling and testing shall be as per respective specification under the supervision of client/consultant. After completing concrete work required curing arrangements are kept ready. Curing will be carried out as per the IS. The de-shuttering of formwork of concrete surface will be as per IS 456 without any deviations.

86. After the completion of the super structure the required finishes viz. plastering, water proof plastering and other amenity works as per the specifications. Finally, the entire reservoir will be white washed besides application of necessary approved color shade.

87. Following Table 10 shows the details of construction activities involved in the subproject.

Table 10: Construction Activities for the Subproject

Component	Construction method	Likely waste generated
Water supply line	Trench excavation along the identified main roads of about 1 m plus pipe dia, but in some case, it may go deeper. A bed of sand/murrum of 100 mm thick will be prepared at the bottom and pipes will be placed and joined. Excavated soil will be replaced and compacted. Where the pipes are laid in the roadway, handheld pneumatic drill will be used to break the road surface. Construction activity will be conducted along the roads and will cover most part of the city. The work will be conducted by a team of 5 workers at each site	154,763 m^3 of soil will be excavated; 90-95% will be utilized for refill; remaining soil (15,476 m^3) need to be disposed off This excess soil shall be used for filling if required or stored/ dumped in approved debris disposal site.
Water reservoirs	Excavation, compaction and consolidation of earth, bar bending, concreting, staging and finishing work, etc.	1,468.2 m^3 of soil will be excavated; 90% will be utilized for refill; remaining soil (1,46.82 m^3) need to be disposed off

m^3 = cubic meter, dia = diameter, m = meter, mm = millimeter.

88. Although construction of the pipelines involve quite simple techniques of civil work, the invasive nature of excavation and the subproject locations in the built-up areas of Udupi, where there are a variety of human activities, will result to impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration.

89. Physical impacts will be reduced by the method of working and scheduling of work, whereby the project components will be (i) constructed by small teams working at a time; and (ii) any excavation done near sensitive area like school, religious places and house will be protected as per standard construction practices. These are discussed in detail in the following sections.

90. While trenching at densely populated areas like market place or layouts, roads with heavy traffics additional care has to be taken. Hard barricade should be mandatorily provided along with caution board and traffic diversion boards. Some of the densely populated area identified at Udupi are Manipal, Shivalli, Malpe, Parkala, Thenkapete, Siribeedu, Bailoor, Santhekatte, Kalyanpura, Kakkunje, Ambalpaday, Brahamagiri, Karavali Junction. Some narrow roads are Manchi Mulastana Road, Kakkunje school road, Kolambe Road, Bhujanga Rao road, Kodange- Tulaja Bhavani road, Saralebettu Bhajana Mandir road, Saralebettu manipal End point road, Vidyarathna Nagara cross road., Poornaprajna Road Udupi. Roadand/or located in busy commercial area. Therefore, full closure will be required in those stretches. Prior to starting of work, contractor should prepare Construction Management Plan. The Construction Management Plan should be site specific and has to submit every month before starting the work. The Construction Management Plan will include the method statement for construction works, Utility Management and Contingency Plan, Traffic Management Plan, Work camp and Labour Camp details, Safety measures taken for the workers and the public, etc.

91. The method statement for pipeline works should be simple and explain the contractor's work process that is actually conducted on site, with safety and safeguard concerns. Method Statement is very important, particularly for pipe line works along the roads. Method Statement can be prepared for each stretch (say 1 km) /specific site based on the project area. Method statement should be in a table format with appended site layout map and covers the following:

(i) Work description;
(ii) No. of workers (skilled and unskilled);
(iii) Details of plant, equipment and machinery, vehicles;
(iv) Work duration (total, and activity-wise, for example for pipe laying, from excavation to road resurfacing/testing);
(v) PPE (helmet, gloves, boots, etc.) details for each type of work;
(vi) Details of materials at each site (type and quantity);
(vii) Risks/hazards associated with the work (for example, Trench excavation will have risks such as trench collapse, persons/vehicles falling into trench, structural risk to nearby buildings, damage to buildings, infrastructure, etc.);
(viii) Construction waste/debris generated (details and quantity);
(ix) Detail the sequence of work process (step-by-step) including specific details of each work;
(x) Contractor's supervision and management arrangements for the work;
(xi) Emergency: Designate (a) responsible person on site, and (b) first aider;
(xii) Typical site layout plan including pipe trenching, placement of material, excavated earth, barricading, etc.; and
(xiii) The pipelines are to be laid along the roads. The excavated soil, placed along the trench may get disturbed due to wind, rain water and the movement of workers, vehicles and pedestrians, and spill onto road way – disturbing road users, creating dust, road safety issues, etc., and also into nearby open drains.

92. The following should be included in the site layout plan:

(i) Provide barricading/security personnel at the site to prevent entry/trespassing of pedestrian/vehicles into the work zone;
(ii) Location of temporary stockpiles and provision of bunds;
(iii) Separation of stockpiles areas with workers/vehicle movement paths to avoid disturbing the stockpiled soil;
(iv) Wetting of soil to arrest dust generation by sprinkling water; and
(v) Waste/surplus soil and concrete debris utilization and disposal plan – indicate expected duration of temporary stockpiling along the trench at each site and identify final surplus soil utilization/disposal site in consultation with PIU.

93. **Sources of Materials.** Significant amount of gravel, sand and aggregate, will be required for this subproject. The construction contractor will be required to:

(i) Use quarry sites and sources permitted by Mines and Geology Department only;
(ii) No new quarry sites shall be developed for the subproject;
(iii) Verify suitability of all material sources and obtain approval of implementing agency; and
(iv) Submit on a monthly basis documentation of sources of materials to PMDCSC.

94. **Air Quality.** It is most certain that work will be conducted during the dry season, so there is potential for creating dust from the excavation of dry soil, backfilling, transportation to disposal, and from the import and storage of sand/gravel for bedding. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will also induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, Sulphur oxides, particulate matter, nitrous oxides, and hydrocarbons) but temporary and during construction activities only. To mitigate the impacts, construction contractors will be required to:

(i) Consult with PIU on the designated areas for stockpiling of clay, soils, gravel, and other construction materials;
(ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather;
(iii) Bring materials (aggregates, sand, etc. gravel) as and when required;
(iv) Use tarpaulins to cover sand and other loose material when transported by vehicles;
(v) Clean wheels and undercarriage of vehicles prior to leaving construction site; and
(vi) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly; ensure valid Pollution Under Control (PUC) Certificates for all vehicles and equipment used in the construction activity.

95. **Noise Levels.** The soils are deep in the subproject area and therefore activities like rock cutting/blasting that generate high noise are not anticipated. In isolated areas where a hard stratum is encountered (especially for deep pipe lines in some locations requiring using of pneumatic drills, there will be high noise during the activity. Also, where the pipelines are required to be laid in the roadway, pneumatic drills will be used to break open the road surface. Pneumatic drills typically generate an equitant noise of 82-98 A-weighted decibels (dBA), at 1 m distance from the activity. Increase in noise level may be caused by excavation equipment, and the transportation of equipment, materials, and people. The sensitive receptors are the general population and socio-cultural institutions in the area. Noise will be for a short term (about 2-3 days at each location) thus impact is minimal and short-term. The construction contractor will be required to:

(i) Plan activities in consultation with the PIU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance;
(ii) Construction work shall be limited to day light hours (6 AM to 6 PM);
(iii) Provide prior information to the local public about the work schedule;
(iv) Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiseling;
(v) Minimize noise from construction equipment/pneumatic drills by using silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor;
(vi) Maintain maximum sound levels not exceeding 80 dbA when measured at a distance of 10 m or more from the vehicle/s; and
(vii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach.

96. **Surface Water Quality.** The water source is River Swarna and River Varahi. There is no construction in river. Udupi receives high rainfall (4,096 mm). The South – West Monsoon winds brings rainfall from June to September while the North–East monsoon winds delivers further rainfall from October to December. Due to these reasons and also that excavation will not certainly be conducted during rains, there is no impact on drainage and surface water quality is envisaged. In unavoidable case of excavation during monsoons, there may be temporary impacts like flooding of construction sites, mixing of construction waste and material within the runoff, etc. This may lead to silting and blockage of drains and water bodies. Mobilization of settled silt materials, run-off from stockpiled materials, and chemical contamination from fuels and lubricants during construction works can contaminate downstream surface water quality of the streams draining

the City. These potential impacts are temporary and short-term duration only and to ensure these are mitigated, construction contractor will be required to:

(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets.
(ii) Lay pipelines during dry season and closing of all trenches before rainy season and avoid any chances of collecting the water in the trenches or pumping.
(iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas (Appendix 6).
(iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies
(v) Provide temporary bunds for stockpiles and materials. Place storage areas for fuels and lubricants away from any drainage leading to water bodies. Storage structure should consider 110% capacity bund.
(vi) Dispose any wastes generated by construction activities in designated sites.
(vii) Conduct surface quality inspection and monitoring.

97. **Groundwater**. Subproject activities do not interfere with groundwater regime, no groundwater abstraction proposed nor do the activities affect groundwater quality. Another physical impact that is often associated with excavation is the effect on drainage and the local water table if groundwater and surface water collect in the voids. To ensure that water will not pond in pits and voids near project location, the construction contractor will be required to conduct excavation works on non-monsoon season to the maximum extent possible.

98. **Landscape and Aesthetics.** The construction work is likely to generate considerable quantities of waste soil. The pipe laying work will generate surplus soil; as small diameter pipes are proposed it will generate only 5-10% as surplus as most of the soil will be used for refilling after the pipe is laid in trench. Indiscriminate disposal of the soil and waste, excess construction material, concrete, packing materials, containers, lubricants and oils may affect the local environment at the disposal location. These impacts are negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Prepare and implement Waste / Spoil Management Plan – it should present how the surplus Waste generated will temporarily stocked at the site, transported and disposed properly;
(ii) Avoid stockpiling of excess excavated soils as far as possible;
(iii) Avoid disposal of any debris and waste soils in the forest areas and in or near water bodies/rivers;
(iv) Coordinate with Udupi CMC for beneficial uses of excess excavated soils or immediately dispose to designated areas;
(v) Recover used oil and lubricants and reuse or remove from the sites;
(vi) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
(vii) Remove all wreckage, rubbish, or temporary structures which are no longer required; and
(viii) Request PMU/PMDCSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.

99. **Accessibility.** Transport infrastructure will be affected by the pipe laying work, as in the narrower streets there is not enough space for excavated soil to be piled off the road. The road

itself may also be excavated in places where there is no available land to locate pipes alongside. Traffic will therefore be disrupted, and in some very narrow streets the whole road may need to be closed for short periods. Following roads require permission from traffic police: Manchi Mulastana Road, Kakkunje school road, Kolambe Road, Bhujanga Rao road, Kodange- Tulaja Bhavani road, Saralebettu Bhajana Mandir road, Saralebettu manipal End point road, Vidyarathna Nagara cross road., Poornaprajna Road Udupi. Road, Parkala–Karkala road, Manipal –Udupi Road, Udupi Malpe road, Maruthi Vithika Road, Taluk Office Road, Hudco Colony Road, Santhekatte-Kalyanpura Road, Kakkunje-Manipal Road, and Diana- Kukkikatte road. Potential impact is negative but short term and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan pipeline work in consultation with the traffic police;
(ii) Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time;
(iii) Provide for immediate consolidation of backfilling material to desired compaction – this will allow immediate road restoration and therefore will minimize disturbance to the traffic movement;
(iv) Schedule transport and hauling activities during non-peak hours;
(v) Do not close the road completely, allow traffic to move on one line;
(vi) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(vii) In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions;
(viii) At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints;
(ix) Keep the site free from all unnecessary obstructions;
(x) Drive vehicles in a considerate manner; and
(xi) Prepare a Traffic Management Plan – a template is provided for reference at Appendix 7.

100. Where ever road width is minimal, there will be temporary loss of access during the laying of pipes. Under those circumstances, contractor can adopt following measures:

(i) Inform the affected local population two days in advance about the work schedule;
(ii) Plan and execute the work in such a way that the period of disturbance/ loss of access is minimum; and
(iii) Provide pedestrian access in all the locations until normalcy is restored.

101. **Impacts on Social Sensitive Areas.** Since the work is being conducted in an urban area, sensitive areas like schools, hospitals and religious centre, the excavation of trenches and pipe laying activity will create nuisance and health hazard to children and people with ailments. The measures suggested under various heads in this section will minimize the impact in general in all areas; however, special attention is necessary at these locations. Following measures shall be implemented in 250 m around the sensitive locations (schools, hospitals, and religious centers):

(i) No material should be stocked in this area; material shall be brought to the site as and when required;

(ii) Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles;
(iii) No work should be conducted near the religious places during religious congregations;
(iv) Material transport to the site should be arranged considering school timings; material should be in place before school starts;
(v) Notify concerned schools, hospitals etc., 2 weeks prior to the work; conduct a 30-minute awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts; and
(vi) Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.

102. **Socio-Economic – Income.** All of the project components will be located in government land and existing ROW. Excavation of trenches and pipe laying work will obstruct access to residences/commercial buildings adjacent to the pipeline. Disruption of access to commercial establishments may affect livelihood. Since many of the roads are narrow, construction activities may also obstruct traffic. The potential impacts are negative and moderate but short-term and temporary. The construction contractor will be required to:

(i) Leave space for access between mounds of excavated soil;
(ii) Provide wooden planks/footbridges for pedestrians and metal sheets for vehicles to allow access across trenches to premises where required;
(iii) Consult affected businesspeople to inform them in advance when work will occur;
(iv) Address livelihood issues, if any; implement the resettlement plan to address these issues;
(v) Provide sign/caution/warning boards at work site indicating work schedule and traffic information; prevent public entry into work sites through barricading and security;
(vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints;
(vii) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools;
(viii) Prepare and implement spoils management plan; and
(ix) Provide alternate sources of clean water until water supply is restored.

103. **Socio-Economic-Employment.** Manpower will be required during the construction period (36 months). This can result to generation of contractual employment and increase in local revenue. Thus, potential impact is positive and long-term. The construction contractor will be required to:

(i) Employ local labor force to the maximum extent, if manpower is available; and
(ii) Comply with labor laws.

104. **Occupational Health and Safety.** Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The construction contractor will be required to:

(i) Comply with all national, state and local core labor laws (See Appendix 2 of this IEE);
(ii) Develop and implement site-specific Health and Safety Plan which will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; (c) Health and Safety Training[4] for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;
(iii) All trenches deeper than 1 m shall be protected with hard barricade to avoid safety risks to workers, public and nearby buildings/structures;
(iv) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(v) Provide medical insurance coverage for workers;
(vi) Secure all installations from unauthorized intrusion and accident risks;
(vii) Provide supplies of potable drinking water;
(viii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances;
(ix) Provide health and safety orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers;
(x) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(xi) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(xii) Ensure moving equipment is outfitted with audible back-up alarms;
(xiii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate;
(xiv) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively; and
(xv) Overall, the contractor should comply with International Finance Corporation (IFC) Environmental, Health and Safety (EHS) Guidelines on Occupational Health and Safety (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2Boccupational%2Bhealth%2Band%2Bsafety.pdf?MOD=AJPERES).

105. **Community Health and Safety.** Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. In most of the cases location of project sites are along the roadways, hence safety risk to community is to

[4] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence, but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective, and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

be considered. The pipe line work may require trenches along the roads including in narrow streets; unprotected trench excavation may endanger the stability of nearby buildings/structures. Potential impact is negative but short-term and reversible by mitigation measures. The construction contractor will be required to:

(i) Provide hard barricading for all deep excavations that may require especially for pipe lines; identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work;
(ii) Plan material and waste routes to avoid times of peak-pedestrian activities;
(iii) Liaise with Udupi CMC in identifying risk areas on route cards/maps;
(iv) Maintain regularly the vehicles and use of manufacturer-approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure;
(v) Provide road signs and flag persons to warn of dangerous conditions, for all work sites along the roads; and
(vi) Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety (this can be downloaded fromhttp://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2Bcommunity%2Bhealth%2Band%2Bsafety.pdf?MOD=AJPERES).

106. **Work Camps.** Operation of work camps can cause temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants. Potential impacts are negative but short-term and reversible by mitigation measures. Provision of proper living facilities and basic amenities (water, sanitation, fire safety, health and safety, etc) shall be ensured. The construction contractor will be required to comply with the following. Overall, the contract should follow the IFC EHS guidelines specific to workers accommodation (this can be downloaded from http://www1.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external corporate_site/ifc+sustainability/publications/publications_gpn_workers accommodation).

(i) Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located at least 200 m from residential areas.
(ii) Minimize removal of vegetation and disallow cutting of trees.
(iii) Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge.
(iv) The camp site should be adequately drained to avoid the accumulation of stagnant water.
(v) Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination.
(vi) Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided on basis of 1 per 15 or less persons.
(vii) Train employees in the storage and handling of materials which can potentially cause soil contamination.
(viii) Recover used oil and lubricants and reuse or remove from the site.
(ix) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas.
(x) Remove all wreckage, rubbish, or temporary structures which are no longer required.

(xi) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work.
(xii) The work camp details should be included in the Construction Management Plan.

107. **Social and Cultural Resources - Chance Finds.** Subproject area is not a potential archaeological area and therefore no impacts envisaged. Nevertheless, the construction contractor will be required to:

(i) Create awareness among the workers and supervisors about the chance finds during excavation work.
(ii) Stop work immediately if any finds are suspected to allow further investigation.
(iii) Inform archaeological agencies promptly if a find is suspected and take any action they require to ensure its removal or protection in situ.
(iv) Adjacent to important religious sites, undertake excavation and construction work in such a way that no structural damage is caused to the building.

108. **Debris Disposal.** Prior to the commencement of works, contractor shall identify a debris disposal site in consultation with the Udupi CMC and adhering to following criteria:

(i) The said site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities.
(ii) Debris disposal site shall be at least 200 m away from surface water bodies.
(iii) No residential areas shall be located within 100 m downwind side of the site.
(iv) The site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.
(v) The local governing body and community shall be consulted while selecting the site.

F. Operational and Maintenance Impacts

109. Operation and Maintenance of the water supply system will be carried out by the Udupi CMC. The system has a design life of 30 years, during which shall not require major repairs or refurbishments and should operate with little maintenance beyond routine actions required to keep the equipment in working order. The stability and integrity of the system will be monitored periodically to detect any problems and allow remedial action if required. Any repairs will be small-scale involving manual, temporary, and short-term works involving regular checking and recording of performance for signs of deterioration, servicing and replacement of parts.

110. Recurrence of pipe bursting and leakage problems can be managed by the leak detection and water auditing surveys. Udupi CMC will be required to ensure that the leakage rectification time is minimized.

111. Improper disposal of silt and debris removed from trenches could cause inconvenience to public. Silt and debris shall be collected in trucks and transported to the approved disposal site and or can be used as covering material for wastes being landfilled.

112. Recurrence of blockage and leakage problems. Although impact is likely to be minimal due to new and well-designed efficient system, it should be ensured that leak detection and restoration time is minimized to the extent possible.

113. Increased water supply will increase the sewage generation, which needs to be safely collected, treated and disposed. A comprehensive sewerage system to be developed.

G. Cumulative Impacts

114. Cumulative impacts are those that result from the successive, incremental, and/or combined effects of a project or activity when added to other existing, planned, and/or reasonably anticipated future ones. The subproject is proposed to improve municipal water supply in Udupi, by providing new OHTs, distribution lines in currently uncovered areas, and to improving water distribution lines in the presently covered areas. Subproject is limited to improvement of water distribution system and therefore no notable cumulative impacts envisaged. During the construction work, dust pollution is anticipated from the subproject activities. This, combined with the other usual construction activities in urban areas, may increase the particulate matter concentration in ambient air. Dust control measures suggested in the EMP will minimize the dust generation from the subproject construction activities. Therefore, no significant impacts envisaged.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

115. In order to identify the adverse social impact of the project a joint site visit was carried out by the ULB engineers, Resettlement Specialist and design engineer of the consultant team from 10 October 2017 along the raw water pumping line and from 1 April 2016 to 9 August 2017 along the busy areas (commercial centers and narrow streets) of Udupi. Meetings and consultations with relevant Government Departments were carried out to assess the Project approach. The subproject is formulated in close consultation with public representatives of Udupi CMC, and accordingly the CMC passed a resolution for preparation of subproject (Appendix 8).

116. Public consultations through focus group discussions (FGDs) were held with project beneficiaries and project-affected people. Public consultation was conducted in the areas where pipes will be laid and the surrounding areas of all 7 OHTs' construction sites. The public consultations were conducted along with the Ward Councilors (Elected Representatives), ULB officers, PIU officers and Social Development Specialist of PMDCSC. A total 32 stakeholders in the subproject alignments were consulted. Of these, 11 were women. During the meeting local public and affected people shared their views to the project team. Following are the comments/suggestions of the participants:

(i) The work should be completed within the shortest possible time as people of the project proposed locations are facing a lot of problems due to the absence of the proposed infrastructure at present;
(ii) The local residence should be informed about the trenching at least one week before;
(iii) Employment may be provided to the local skilled and semi-skilled laborers during the construction stage;
(iv) Inconvenience and traffic disturbances due to construction work in the city should be minimized as far as possible; and
(v) People are willing to cooperate to implement the project successfully.

A. Project Stakeholders

117. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Primary stakeholders are:

(i) Residents, shopkeepers and businesspeople near the work sites;
(ii) Public representatives and prominent citizens of the City;
(iii) Udupi CMC; and
(iv) KUIDFC, Government of Karnataka.

118. Secondary stakeholders are:

(i) Other concerned government institutions (utilities, regulators, etc.);
(ii) NGOs and community-based organizations working in the affected communities;
(iii) Other community representatives (prominent citizens, religious leaders, elders, women's groups);
(iv) The beneficiary community in general; and
(v) ADB as the funding agency.

B. Consultation and Disclosure up to Date

119. Public consultation meetings were conducted during the project preparation and design stages. Various forms of public consultations (consultation through ad hoc discussions on site) have been used to discuss the project and involve the community in planning the project and mitigation measures.

120. A Public consultation was conducted on 20 October 2016 in the surrounding areas of all 7 OHTs' construction sites and also distribution network areas to discuss the proposed project and likely environmental issues and mitigation measures. various stakeholders – public representatives, officials from various agencies were participated in the workshop. The consultation meeting details including photographs are attached in Appendix 9. Consultations are also conducted along the raw water pipeline from intake to WTP, which is proposed under government-funded bulk water supply project. All participants supported the project, and opined that work should be conducted with minimum disturbances.

C. Future Consultation and Disclosure

121. Executive agency and implementing agency shall extend and expand the consultation and disclosure process significantly during implementation of the Investment Program.

122. **Consultation during Construction.** Prior to start of construction, PIU will conduct meaningful consultation[5] and information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work (mainly pipeline work) with local communities to

[5] Meaningful consultation will: (i) be carried out on an ongoing basis throughout the project cycle; (ii) involve timely disclosure of relevant information. Affected peoples and stakeholders will have access to relevant project information prior to any decision-making that will affect them; (iii) be conducted free of intimidation or coercion; and (iv) be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups.

reduce disturbance and other impacts and regarding the project grievance redress mechanism. Project information and construction schedule will be provided to the public via mass media (newspapers, television, websites etc.,). A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase. Contractor will provide prior public information (in Kannada and English) about the construction work in the area, once 7 days prior to the start of work and again a day before the start of work via pamphlets. At the work sites, public information boards will also be provided to disseminate project related information.

(i) Public meetings with affected communities (if any) to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and
(ii) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

123. **Project Disclosure.** Executive summary of the IEE will be translated in Kannada and made available at the offices of PMU, RPMU, PIU, and Udupi CMC and also displayed on their notice boards. Hard copies of the IEE will be accessible to citizens as a means to disclose the document and at the same time creating wider public awareness. Electronic version of the IEE in English and Executive Summary in Kannada will be placed in the official website of the KUIDFC after approval of the IEE by ADB. Stakeholders will also be made aware of grievance register and redress mechanism.

124. Public information campaigns to explain the project details to a wider population will be conducted. Public disclosure meetings will be conducted at key project stages to inform the public of progress and future. Prior to start of construction, the PIU will issue Notification on the start date of implementation in local newspapers A board showing the details of the project will be displayed at the construction sites for the information of public.

125. Local communities will be continuously consulted regarding location of construction camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, radio broadcasts, road signage, etc.

(i) Public information campaigns (via newspaper, TV and radio) to explain the project to the wider City population and prepare them for disruption they may experience once the construction program is underway;
(ii) Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in Kannada; and
(iii) Formal disclosure of completed project reports by making copies available at convenient locations in the study cities, informing the public of their availability, and providing a mechanism through which comments can be made.

126. Based on ADB requirements, the following will be posted on ADB website: (i) this IEE, upon finalization and approval of ADB; (ii) a new or updated IEE, if prepared, reflecting significant changes in the Project during implementation; (iii) corrective action plan prepared during Project implementation to address unanticipated environmental impacts and to rectify non-compliance to

EMP provisions; and (iv) environmental monitoring reports (Appendix 10). Documents will also be available on the websites of KUIDFC and Udupi CMC.

VII. GRIEVANCE REDRESS MECHANISM

127. There will be several tiers for grievance redress process. Simple grievances for immediate redress will first be resolved at site by Contractor. If unaddressed for up to 7 days the complainants may go to PIU officer in ULB responsible for addressing resettlement/social issues. Resident engineer and the ULB will assist in resolving the issues. Name, designation and contact number of personnel responsible for grievance redress at ULB and RPMU, will be posted at Contractor's and PMDCSC's site office in full visibility of public. Grievances of immediate nature should be resolved at site/ within ULB/PIU level within 15 days of registration of grievances.

128. A project GRM will cover the project's towns for all kinds of grievances and will be regarded as an accessible and trusted platform for receiving and facilitating project related complaints and grievances. The multi-tier GRM for the program will have realistic time schedules to address grievances and specific responsible persons will be identified to address grievances and whom the displaced persons have access to interact easily.

129. Awareness on grievance redress procedures will be created through Public Awareness Campaign with the help of print and electronic media. The Safeguards Officer of RPMU will ensure that vulnerable households are also made aware of the GRM and assured of their grievances to be redressed adequately and in a timely manner.

130. There will be multiple means of registering grievances and complaints by dropping grievance forms in complaint/ suggestion boxes at accessible locations, or through telephone hotlines, email, post or writing in a complaint registrar book in ULB's project office. There will be complaint registrar book and complaint boxes at construction site office to enable quick response of grievances/ complaints for urgent matters. The name, address and contact details of the persons with details of the complaint / grievance, location of problem area, date of receipt of complaint will be documented. The RPMU's SO will be responsible at the project level for timely resolution of the environmental and social safeguards issues and registration of grievances, and communication with the aggrieved persons.

131. **Grievance Redressal Process.** There will be several tiers for grievance redress process. Simple grievances for immediate redress will first be resolved at site by Contractor. If unaddressed for up to 7 days the complainants may go to PIU officer in ULB responsible for addressing resettlement/social issues. Resident engineer and the ULB will assist in resolving the issues. Name, designation and contact number of personnel responsible for grievance redress at ULB and RPMU, will be posted at Contractor's and PMDCSC's site office in full visibility of public. Grievances of immediate nature should be resolved at site/ within ULB/ PIU level within 15 days of registration of grievances.

132. All the Grievances that cannot be resolved at ULB/PIU within 15 days will be forwarded to the grievances redressal committee (GRC) headed by Deputy Project Director, RPMU at Subdivision level who will review and resolve within 15 working days of grievance being registered with assistance of the concerned PIU/ULB personnel if required. The grievances of critical nature and those cannot be resolved at GRC level should be referred to District Level Implementation Committee (DLIC) set up at district level headed by Deputy Commissioner who will review the grievances and to be settled within 30 days. All documents related to grievances, follow up action taken to resolve along with explanatory note on nature, seriousness and time taken for grievance

redress shall be prepared by RPMU Social Development Officer and circulated to DLIC members at least a week prior to scheduled meeting. The decision taken at the DLIC level will be communicated to the complainant by Social Development Officer, RPMU through ULB/PIU

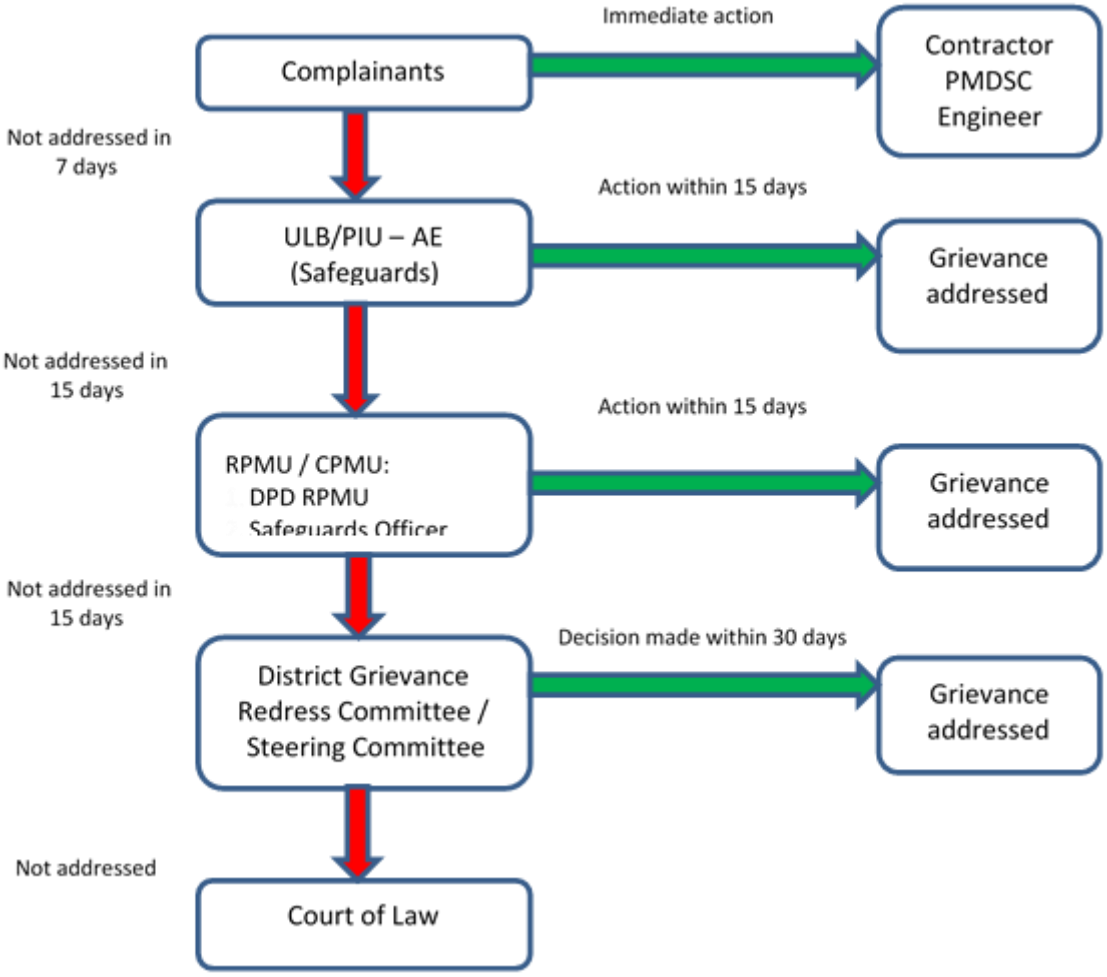
133. For any issues that remain unresolved by the GRC it is referred to DLIC at the District Level, and if the decisions taken at such meetings are not acceptable, the complainants /DPs can approach the Court of Law as per Government of Karnataka legal procedure.

A. Grievance Redress Committee Composition and Selection of Members

134. The GRC for the project will be headed by a Special Land Acquisition Officer/Assistant Commissioner of the concerned sub-Division as Chairman of the sub Division with members as follows: (i) ULB Commissioners/Chief Officer of the concerned ULB towns, (ii) Deputy Project Director as member Secretary and Convener, (iii) PMDCSC Engineer, (iv) Affected Community member/NGO, (v) Safeguards Officer of RPMU Mangalore will shoulder responsibility of keeping records of grievances/ complaints in details. Safeguards Officer will be responsible for coordinating with all GRC members and the displaced persons for grievance redressal. The grievances of critical nature and those cannot be resolved at Divisional level should be referred to DLIC set up at District level they will determine the merit of each grievance and attempt to resolve the same within a month from the date of lodging of complaints. The decision of DLIC is final and cannot be contested in any other forum except in the Courts of Law.

135. Affected Person also can use the ADB Accountability Mechanism through directly contact (in writing) to the Complaint Receiving Officer (CRO) at ADB headquarters or to ADB Indian Resident Mission. The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will include in the project information document (PID) to be distributed to the affected communities, as part of the project GRM.

Figure 10: Grievance Redress Process



AE = Assistant Engineer, CPMU = City Program Management Unit, DPD = Deputy Project Director, PIU = Program Implementation Unit, PMDCSC = Project Management Design and Construction Supervision Consultant, RPMU = Regional Program Management Unit, ULB = urban local body.

136. **Recordkeeping**. Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU (with the support of PMDCSC) and submitted to PMU.

137. **Information Dissemination Methods of the Grievance Redress Mechanism**. The PIU, assisted by PMDCSC Public Communication, Awareness, Resettlement and Rehabilitation Consultant (PCARRC) will be responsible for information dissemination to affected persons and general public in the project area on grievance redress mechanism. Public awareness campaign will be conducted to ensure that awareness on the project and its grievance redress procedures is generated. The campaign will ensure that the poor, vulnerable and others are made aware of grievance redress procedures and entitlements per agreed entitlement matrix including. whom to contact and when, where/ how to register grievance, various stages of grievance redress process, time likely to be taken for redress of minor and major grievances, etc. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PIU,

offices, ULB notice boards and on the web, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to ADB.

138. **Periodic Review and Documentation of Lessons Learned.** The PMU will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the PIU's ability to prevent and address grievances.

139. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the respective PIU. Cost estimates for grievance redress are included in resettlement cost estimates.

140. **Country legal procedure**. An aggrieved person shall have access to the country's legal system at any stage, and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

141. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person can also use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB India Resident Mission. The complaint can be submitted in any of the official languages of ADB's developing member countries. Before submitting a complaint to the Accountability Mechanism, it is recommended that affected people make a good faith effort to resolve their problems by working with the concerned ADB operations department (in this case, the resident mission). Only after doing that, and if they are still dissatisfied, they could approach the Accountability Mechanism. The ADB Accountability Mechanism information will be included in the project-relevant information to be distributed to the affected communities, as part of the project GRM.

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management Plan

142. The purpose of the Environmental Management Plan (EMP) is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assessment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impact of the project; and (iv) ensuring that safety recommendations are complied with.

143. The contractor will be required to submit to PIU, for review and approval, a site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program as per SEMP. No works are allowed to commence prior to approval of SEMP.

144. A copy of the updated EMP/SEMP must be kept on work sites at all times. The EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

145. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts, (ii) carry out all of the monitoring and mitigation measures set forth in the EMP, and (iii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

146. Tables 11 to 13 shows the potential adverse environmental impacts, proposed mitigation measures, responsible parties, and estimated cost of implementation for 24x7 water supply distribution network. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. Table 14 shows the EMP to be implemented during project implementation and operation.

Table 11: Environmental Management Plan for Anticipated Impacts – Pre-Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
Submission of updated environmental management plan (EMP)/site environmental plan (SEP); EMP implementation and reporting	Unsatisfactory compliance to EMP	(i) Appoint Safeguards (Environmental, Health and Safety or EHS) Engineer to ensure EMP implementation; (ii) Submission of updated EMP/site-specific environmental management plan (SEMP); and (ii) Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such as photographs.	Contractor	(i) mobilization of EHS engineer; (ii) submission of SEMP prior to start of works; and (iii) submission of monthly reports	Contractor cost
Trees on project sites	Tree cutting	(i) Further minimize removal of trees, if possible, by adopting to site condition and with appropriate layout design (Overhead tank or OHT sites) and alignments (pipelines); (ii) For any tree cutting that may be required, obtain prior permission from Forest Department; and (iii) Plant and maintain 10 trees for each tree that is removed.	Contractor in collaboration with Urban local body (ULB)/Program Implementation Unit (PIU)	(i) Layout plan of OHTs; (ii) tree cutting/ pruning permission; and (iii) Compensatory tree plantation as part of the project.	Cost for implementation of mitigation measures responsibility of contractor.
Utilities	Telephone lines, electric poles and wires, water lines within proposed project area	(i) Identify and include locations and operators of these utilities in the detailed design documents, during design validation phase and preconstruction phase, to prevent unnecessary disruption of services during construction phase; (ii) Conduct detailed site surveys with the construction drawings and discuss with the respective agencies before ground clearance; and (iii) Require construction contractors to prepare a	ULB/PIU	(i) List of affected utilities and operators; and (ii) Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan, and traffic management plan.	No cost required. Mitigation measures are part of terms of reference (TOR) of PMU, design engineers, and supervising consultants.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		contingency plan to include actions to be done in case of unintentional interruption of services.			
Social and Cultural Resources – Chance finds	Ground disturbance can uncover and damage archaeological and historical remains	(i) Create awareness among the workers and supervisors about the chance finds during excavation work; (ii) Stop work immediately if any finds are suspected to allow further investigation; and (iii) Inform archaeological agencies promptly if a find is suspected, and take any action they require to ensure its removal or protection in situ.	Construction Contractor and Project Management, Design and Construction Supervision Consultant (PMDCSC)	Chance Finds Protocol	No cost required.
Construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas.	Disruption to traffic flow and sensitive receptors	(i) Prioritize areas within or nearest possible vacant space in the project location; (ii) If it is deemed necessary to locate elsewhere, consider sites that will not promote instability and result in destruction of property, vegetation, irrigation, and drinking water supply systems; (iii) Do not consider residential areas; (iv) Take extreme care in selecting sites to avoid direct disposal to water body which will inconvenience the community; and (v) For excess spoil disposal, ensure (a) site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, written consent from landowners (not lessees) will be obtained; (b)	Contractor to determine locations prior to beginning of construction works and to be reviewed and approved by PIU	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas; and (ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land.	No cost required.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		debris disposal site shall be at least 200 m away from surface water bodies; (c) no residential areas shall be located within 50 m downwind side of the site; and (d) site is minimum 250 m away from sensitive locations like settlements, ponds/lakes or other water bodies.			
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	(i) Use quarry sites and sources permitted by Mines and Geology Department only; (ii) No new quarry sites shall be developed for the subproject; (iii) Verify suitability of all material sources and obtain approval of implementing agency; and (iv) Submit on a monthly basis documentation of sources of materials to PMDCSC.	Contractor to prepare list of approved quarry sites and sources of materials with the approval of PMDCSC	(i) List of approved quarry sites and sources of materials; and (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	No cost required. Mitigation measures are part of TOR of PMU, design engineers, and supervising consultants.
Consents, permits, clearances, NOCs, etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and/or stoppage of works	(i) Obtain all necessary consents, permits, clearance, NOCs, etc. prior to start of civil works; (ii) Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc.; and (iii) Include in detailed design drawings and documents all conditions and provisions if necessary.	ULB/PIU and PMDCSC	Incorporated in final design and communicated to contractors.	No cost required. Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PMU. Mitigation measures are part of TOR of PMU, design engineers, and supervising consultants.
Method statement	Use of approved construction practices to minimize construction impacts	Method Statement should be in a Table format with appended site layout map and cover the following: (i) Work description;	Contractor to prepare method statement for review and approval by PMDCSC / PIU prior to start of work.	Review of method statement and implementation of work	No cost required.

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		(ii) Number of workers (skilled and unskilled); (iii) Details of plant, equipment and machinery, vehicles; (iv) Work duration (total, and activity-wise, for example for pipe laying, from excavation to road resurfacing/testing); (v) PPE (helmet, gloves, boots, etc.) details for each type of work; (vi) Details of materials at each site (type and quantity); (vii) Risks/hazards associated with the work (for example, Trench excavation will have risks such as trench collapse, persons/vehicles falling into trench, structural risk to nearby buildings, damage to buildings, infrastructure, etc.); (viii) Construction waste/debris generated (details and quantity); (ix) Detail the sequence of work process (step-by-step) including specific details of each work; (x) Contractor's supervision and management arrangements for the work; (xi) Emergency: Designate (a) responsible person on site, and (b) first aider; (xii) Typical site layout plan including pipe trenching, placement of material, excavated earth, barricading, etc.; and (xiii) The pipelines are to be laid along the roads. The excavated soil, placed along the trench may get disturbed due to wind, rain			

Field	Anticipated Impact	Mitigation Measures	Responsible for Implementation	Monitoring of Mitigation	Cost and Source of Funds
		water and the movement of workers, vehicles and pedestrians, and spill onto road way – disturbing road users, creating dust, road safety issues, etc., and also into nearby open drains.			

Table 12: Environmental Management Plan for Anticipated Impacts – Construction

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
EMP Implementation Training	Impacts on the environment, workers, and community due to improper implementation of EMP	(i) Project manager and all key workers will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; occupational health and safety (OHS), core labor laws, applicable environmental laws, etc.; and (ii) appointment of Environment, Health and Safety (EHS) Engineer by contractor prior to start of work.	Construction Contractor / PIU / PMDCSC	(i) Certificate of Completion (Safeguards Compliance Orientation), (ii) Posting of Certification of Completion at worksites, and (iii) Posting of EMP at worksites.	Cost of EMP Implementation Orientation Training to contractor is responsibility of PMU. Other costs responsibility of contractor.
Air Quality	Emissions from construction vehicles, equipment, and machinery used for installation of pipelines resulting to dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter,	(i) Consult with PIU/PMDCSC on the designated areas for stockpiling of clay, soils, gravel, and other construction materials; (ii) Damp down exposed soil and any stockpiled on site by spraying with water when necessary during dry weather; (iii) Use tarpaulins to cover sand and other loose material when transported by trucks; (iv) Clean wheels and undercarriage of vehicles prior to leaving construction site; and	Construction Contractor	(i) Location of stockpiles; (ii) Complaints from sensitive receptors; (iii) Heavy equipment and machinery with air pollution control devices; and (iv) Certification that vehicles are compliant with Air Act.	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	nitrous oxides, and hydrocarbons.	(v) Fit all heavy equipment and machinery with air pollution control devices which are operating correctly.			
Surface water quality	Mobilization of settled silt materials, and chemical contamination from fuels and lubricants during installation of pipelines can contaminate nearby surface water quality.	(i) Avoid stockpiling of earth fill especially during the monsoon season unless covered by tarpaulins or plastic sheets. (ii) Lay pipelines during dry season and closing of all trenches before rainy season and avoid any chances of collecting the water in the trenches or pumping. (iii) Prioritize re-use of excess spoils and materials in the construction works. If spoils will be disposed, consult with Implementing Agency on designated disposal areas (Appendix 6). (iv) Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies. (v) Provide temporary bunds for stockpiles and materials. (vi) Place storage areas for fuels and lubricants away from any drainage leading to water bodies. Storage structure should consider 110% capacity bund. (vii) Dispose any wastes generated by construction activities in designated sites. (viii) Conduct surface quality inspection and monitoring.	Construction Contractor	(i) Areas for stockpiles, storage of fuels and lubricants and waste materials; (ii) Number of silt traps installed along trenches leading to water bodies; (iii) Records of surface water quality inspection; (iv) Effectiveness of water management measures; and (v) No visible degradation to nearby drainages, nallahs or waterbodies due to civil works.	Cost for implementation of mitigation measures responsibility of contractor.
Noise Levels	Increase in noise level due to earth-moving and	(i) Plan activities in consultation with PIU/PMDCSC so that activities with the greatest	Construction Contractor	(i) Complaints from sensitive receptors;	Cost for implementation of mitigation measures

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	excavation equipment, and the transportation of equipment, materials, and people	potential to generate noise are conducted during periods of the day which will result in least disturbance. (ii) Construction work shall be limited to day light hours (6 AM to 6 PM). (iii) Provide prior information to the local public about the work schedule. (iv) Ensure that there are no old and sensitive buildings that may come under risk due to the use of pneumatic drills; if there is risk, cut the rocks manually by chiseling. (v) Minimize noise from construction equipment/ pneumatic drills by using silencers, fitting jackhammers with noise-reducing mufflers, and portable street barriers the sound impact to surrounding sensitive receptor. (vi) Maintain maximum sound levels not exceeding 80 decibels (dbA) when measured at a distance of 10 m or more from the vehicle/s. (vii) Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach.		(ii) Use of silencers in noise-producing equipment and sound barriers; and (iii) Equivalent day and night time noise levels (See Appendix 3 of this IEE).	responsibility of contractor.
Landscape and aesthetics	Impacts due to excess excavated earth, excess construction materials, and solid waste such as removed concrete,	(i) Prepare and implement spoils management plan; (ii) Avoid stockpiling of excess excavated soils; (iii) Coordinate with Udupi CMC for beneficial uses of excess	Construction Contractor	(i) Complaints from sensitive receptors; (ii) Worksite clear of hazardous wastes such as oil/fuel; and (iii) Worksite clear of any excess excavated earth,	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
	wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items.	excavated soils or immediately dispose to designated areas; (iv) Recover used oil and lubricants and reuse or remove from the sites; (v) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (vi) Remove all wreckage, rubbish, or temporary structures which are no longer required; and (vii) Request PMU/PMDCSC to report in writing that the necessary environmental restoration work has been adequately performed before acceptance of work.		excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers.	
Existing Infrastructure and Facilities	Disruption of service and damage to existing infrastructure at specified project location	(i) Obtain from PMU/PMDCSC the list of affected utilities and operators if any; (ii) Prepare a contingency plan to include actions to be done in case of unintentional interruption of service; and (iii) The public should be given notice at least three days in advance and any accidental breaking should be rectified immediately.	Construction Contractor	Existing Utilities Contingency Plan	Cost for implementation of mitigation measures responsibility of contractor.
Accessibility	Traffic problems and conflicts near project locations and haul road	(i) Plan pipeline work in consultation with the traffic police; (ii) Plan work such that trench excavation, pipe laying, and refilling including compacting, at a stretch is completed in a minimum possible time;	Construction Contractor	(i) Traffic route during construction works including number of permanent signages, barricades and flagmen on worksite (Appendix 7); (ii) Complaints from sensitive receptors; and	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(iii) Provide for immediate consolidation of backfilling material to desired compaction – this will allow immediate road restoration and therefore will minimize disturbance to the traffic movement; (iv) Schedule transport and hauling activities during non-peak hours; (v) Do not close the road completely, allow traffic to move on one line; (vi) Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; (vii) In unavoidable circumstances of road closure, provide alternative routes, and ensure that public is informed about such traffic diversions; (viii) At all work sites public information/caution boards shall be provided – information shall inter-alia include: project name, cost and schedule; executing agency and contractor details; nature and schedule of work at that road/locality; traffic diversion details, if any; entry restriction information; competent official's name and contact for public complaints; (ix) Keep the site free from all unnecessary obstructions; (x) Drive vehicles in a considerate manner; and		(iii) Number of signages placed at project location.	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(xi) Prepare a Traffic Management Plan – a template is provided for reference at Appendix 7.			
Socio-Economic – Income.	Impede the access of residents and customers to nearby shops	(i) Prepare and implement spoils management plan; (ii) Leave spaces for access between mounds of soil; (iii) Provide walkways and metal sheets where required for people; (iv) Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools; (v) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and (vi) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.	Construction Contractor	(i) Complaints from sensitive receptors, (ii) Spoils management plan, and (iii) Number of walkways, signages, and metal sheets placed at project location.	Cost for implementation of mitigation measures responsibility of contractor.
Socio cultural resources	Disturbance to socio cultural resources (religious, educational, health care etc.,), access disruptions etc.,	(i) No material should be stocked close to these areas; material shall be brought to the site as and when required; (ii) Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles; (iii) No work should be conducted near the religious places during religious congregations; (iv) Material transport to the site should be arranged considering school timings; material should be in place before school starts;	Construction Contractor	(i) Visual site observations, and (ii) Public complaints	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(v) Notify concerned schools, hospitals etc., 2 weeks prior to the work; conduct a 30-minute awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and do's and don'ts; and (vi) Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.			
Socio-Economic - Employment	Generation of contractual employment and increase in local revenue	(i) Employ local labor force to the maximum extent, if manpower is available; and (ii) Comply with labor laws.	Construction Contractor	(i) Employment records; (ii) Records of sources of materials; and (iii) Compliance to core labor laws (See appendix 2 of this IEE).	Cost for implementation of mitigation measures responsibility of contractor.
Occupational Health and Safety	Occupational hazards which can arise during work	(i) Comply with all national, state and local core labor laws (See Appendix 2 of this IEE); (ii) Develop and implement site-specific occupational health and safety (OHS) Plan and include in the Construction Management plan. The OHS plan will include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose mask and ear plugs; (c) OHS Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents;	Construction Contractor	(i) Site-specific OHS Plan; (ii) Equipped first-aid stations; (iii) Medical insurance coverage for workers; (iv) Number of accidents; (v) Supplies of potable drinking water; (vi) Clean eating areas where workers are not exposed to hazardous or noxious substances; (vii) record of health and safety orientation trainings (viii) personal protective equipment;	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(iii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; (iv) Provide medical insurance coverage for workers; (v) Secure all installations from unauthorized intrusion and accident risks; (vi) Provide supplies of potable drinking water; (vii) Provide clean eating areas where workers are not exposed to hazardous or noxious substances; (viii) Provide health and safety orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; (ix) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; (x) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; (xi) Ensure moving equipment is outfitted with audible back-up alarms;		(ix) % of moving equipment outfitted with audible back-up alarms; (xi) permanent sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal; and (xii) Compliance to core labor laws (See appendix 2 of this IEE).	

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		(xii) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; (xiii) Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively; and (xiv) Overall, the contractor should comply with International Finance Corporation (IFC) EHS Guidelines on Occupational Health and Safety.			
Community Health and Safety.	Traffic accidents and vehicle collision with pedestrians during material and waste transportation	(i) Provide hard barricading for all deep excavations that may require especially for pipe lines; identify buildings at risk prior to start of excavation work and take necessary precautions for safe conduct of work; (ii) Plan material and waste routes to avoid times of peak-pedestrian activities; (iii) Liaise with Udupi CMC in identifying risk areas on route cards/maps; (iv) Maintain regularly the vehicles and use of manufacturer-approved parts to	Construction Contractor	(i) Traffic Management Plan, and (ii) Complaints from sensitive receptors.	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		minimize potentially serious accidents caused by equipment malfunction or premature failure; (v) Provide road signs and flag persons to warn of dangerous conditions, for all work sites along the roads; and (vi) Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety.			
Work Camps and worksites	Temporary air and noise pollution from machine operation, water pollution from storage and use of fuels, oils, solvents, and lubricants Unsanitary and poor living conditions for workers	(i) Consult with PIU before locating workers camps/sheds, and construction plants; as far as possible located at least 200 m from residential areas; (ii) Minimize removal of vegetation and disallow cutting of trees; (iii) Living facilities shall be built with adequate materials, and should be in good condition and free from rubbish and other refuge; (iv) The camp site should be adequately drained to avoid the accumulation of stagnant water; (v) Provide water and sanitation facilities; water, meeting Indian drinking water standards shall be provided, in adequate quantities (supply of 60- 80 LPCD); all water storage structures must be cleaned regularly and covered properly to avoid any contamination; (vi) Provide separate facilities for men and women; sanitary facilities shall be properly build and well maintained; toilet and bath facilities should be provided	Construction Contractor	(i) Complaints from sensitive receptors, and (ii) Drinking water and sanitation facilities for employees	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		on basis of 1 per 15 or less persons; (vii) Train employees in the storage and handling of materials which can potentially cause soil contamination; (viii) Recover used oil and lubricants and reuse or remove from the site; (ix) Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas; (x) Remove all wreckage, rubbish, or temporary structures which are no longer required; (xi) Report in writing that the camp has been vacated and restored to pre-project conditions before acceptance of work; and (xii) The work camp details should be included in the Construction Management Plan.			
Social and Cultural Resources	Risk of archaeological chance finds	(i) Create awareness among the workers and supervisors about the chance finds during excavation work; (ii) Stop work immediately if any finds are suspected to allow further investigation; (iii) Inform archaeological agencies promptly if a find is suspected, and take any action they require to ensure its removal or protection in situ; and (iv) Adjacent to important religious sites, undertake excavation and construction work	Construction Contractor	Records of chance finds	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		in such a way that no structural damage is caused to the building.			
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of EHS engineer to ensure EMP implementation, and (ii) Timely submission of monitoring reports including pictures.	Construction contractor	Availability and competency of appointed EHS engineer Monthly report	Cost for implementation of mitigation measures responsibility of contractor.
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; (ii) All excavated roads shall be reinstated to original condition; (iii) All disrupted utilities restored; (iv) All affected structures rehabilitated/compensated; (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up; (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be topsoiled and regrassed using the guidelines set out in the revegetation specification that forms part of this document; (vii) The contractor must arrange the cancellation of all temporary services; and (viii) Request PMU/PMDCSC to report in writing that worksites and camps have been vacated and restored to pre-project	Construction Contractor	PMU/PMDCSC report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is satisfactory.	Cost for implementation of mitigation measures responsibility of contractor.

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
		conditions before acceptance of work.			

Table 13: Environmental Management Plan for Anticipated Impacts – Operation

Field	Anticipated Impact	Mitigation Measures	Responsible for Mitigation	Monitoring of Mitigation	Cost and Source of Funds
Check for blockage and leakage problems reducing the water losses	It may affect the water supply system	Effectiveness of leak detection and water auditing to reduce the water losses	Operation and maintenance (O&M) Contractor/Udupi City Municipal Council (CMC)	Udupi CMC	CMC cost
Repair works during O&M	Local disturbances during maintenance work	Contractor shall inform shopkeepers, residents and road users of repair works in advance. If trenches are dug to locate and repair leaks or remove and replace lengths of pipe or illegal connections, the removed material will be replaced in the trench so there will be no waste. The refilled trench shall be re-compacted and brought to the original condition as soon as the repair works are over. Works shall be completed quickly at sensitive areas. Proper access shall be provided to the residents during the repair works If any major maintenance works is to be taken up contractor shall prepare and operate Health and safety plan to protect workers and public. Contractor may request police to divert traffic if necessary.	O&M Contractor / Udupi CMC	Udupi CMC	CMC cost
Increase of sewage	Increased quantity of sewage leads to open area/drain and creates health problems	Develop a comprehensive sewerage system	CMC, Udupi	Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC)/ Government of Karnataka	CMC cost

Table 14: Environmental Monitoring Plan

Monitoring Field	Monitoring Location	Monitoring Parameters	Frequency	Responsibility	Cost
Pre- construction and Construction					
Construction disturbances, nuisances, public and worker safety,	All work sites	Implementation of dust control, noise control, traffic management, and safety measures. Site inspection	Weekly during construction	Supervising staff and safeguards specialists of Project Management Design and Construction Supervision Consultant (PMDCSC) and Program Implementation Unit (PIU)	Part of PIU and PMDCSC terms of reference (TOR)
Ambient air quality	7 points (pipe laying – 4 and overhead tanks or OHTs - 3)	Particulate matter (PM)10, PM2.5, Sulphur Oxide (SO_x), Nitrogen Oxide (NO_x) Monitoring method as prescribed by Central Pollution Control Board (CPCB)	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	Cost of monitoring 90x5000 = ₹450,000
Noise Level	7 points (pipe laying – 4 and OHTs - 3)	Noise level Day and night time noise (dBA) Monitoring method as prescribed by CPCB	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	90x2500 = ₹225,000
Water Quality	3 sites	CPCB standard parameters	Once before start of construction Quarterly (yearly 4-times) during construction	Contractor	30x10,000 = ₹300,000
Operation					
Monitoring of raw and treated water quality	Source, inlet and outlet of water treatment plant (WTP)	Drinking water parameters	Quarterly	Udupi City Municipal council (CMC) through accredited lab/ Karnataka State Pollution Control Board (KSPCB)	CMC operating costs

B. Institutional Arrangements

147. **Executing Agency.** KUIDFC is the executing agency responsible for overall technical supervision and execution of all subprojects funded under the Investment Program. Implementation activities is overseen by Program Management Unit (PMU) established in its head office at Bangalore exclusively for KIUWMIP. PMU is supported by Regional PMU (RPMU) established in Mangalore headed by Deputy Project Director, to support and monitor implementation in PIUs of Tranche 2 program towns. PMU and RPMU are staffed with technical, administrative and financial officials, including safeguards specialists, to manage and monitor program implementation.

148. **Implementing Agency.** The implementing agencies are the respective ULBs, in this case City Municipal Council (CMC) of Udupi. Program Implementation Units (PIUs) are set up in each program ULB for implementation of day-to-day activities in the field.

149. Other than the above institutional setup, District Level Implementation Committee (DLIC) will be set up in each district to monitor implementation of subprojects and institutional reforms. The DLIC shall consist of Deputy Commissioner of District, Deputy Project Director, RPMU, Municipal Commissioners' / Chief Officers of ULB and PMDCSC.

150. For the government-funded bulk water supply project, KUIDFC as the executing agency and Udupi CMC as the implementing agency will be responsible for implementation.

151. **Safeguards Implementation**. The SCMU will ensure that all subprojects comply with environmental safeguards. In each regional office in Mangalore and Davangere, a Safeguards Officer will assist in and coordinate safeguard tasks. For enhancing the monitoring role of environmental safeguards, KUIDFC will consider assigning the environmental officers at the regional officers in implementation stage. In each PIU, an Assistant Engineer (safeguards) will coordinate the safeguard tasks at PIU/town level. For Tranche 2, PIUs are established at Kundapura, Mangalore, Puttur, and Udupi. A Project Management, Design and Construction Supervision Consultant (PMDCSC) will assist PMU and PIUs in the implementation of the entire investment program including compliance with the EARF and RF. PMDCSC is stationed in Mangalore with the field teams in each of the PIUs. PMDCSC team includes an Environmental Specialist and a Social Development Specialist to prepare, implement and monitor all safeguard activities and ensure safeguards compliance. At the civil works stage, Contractor staff will include Safeguards / Environment, Health and Safety (EHS) engineer to supervise and report on EMP implementation.

152. The responsibility fulfilling environmental requirements of Government of India/Government of Karnataka and conducting required level of environmental assessment as per ADB guidelines lies with the PIUs/ implementing agency, i.e. Udupi CMC. Consultant Team will assist the CMC in this regard.

153. The mitigation measures identified through IEEs and EMP will be incorporated into the Investment Program implementation cycle. Mitigation measures, which are to be implemented by the Contractor, shall form part of the Contract Documents. The other mitigation measures will be implemented by the IA/PIU/PMU as specified in the IEE. During the construction phase, PIU with the support of consultant team will monitor the implementation of the EMP and report to the PMU. Implementation of EMP and other environmental related measures and the results of environmental monitoring conducted during implementation will be reported to ADB through semi-

annual Environmental Monitoring Reports. These will also be made available on executing agency (KUIDFC) website for wider public access.

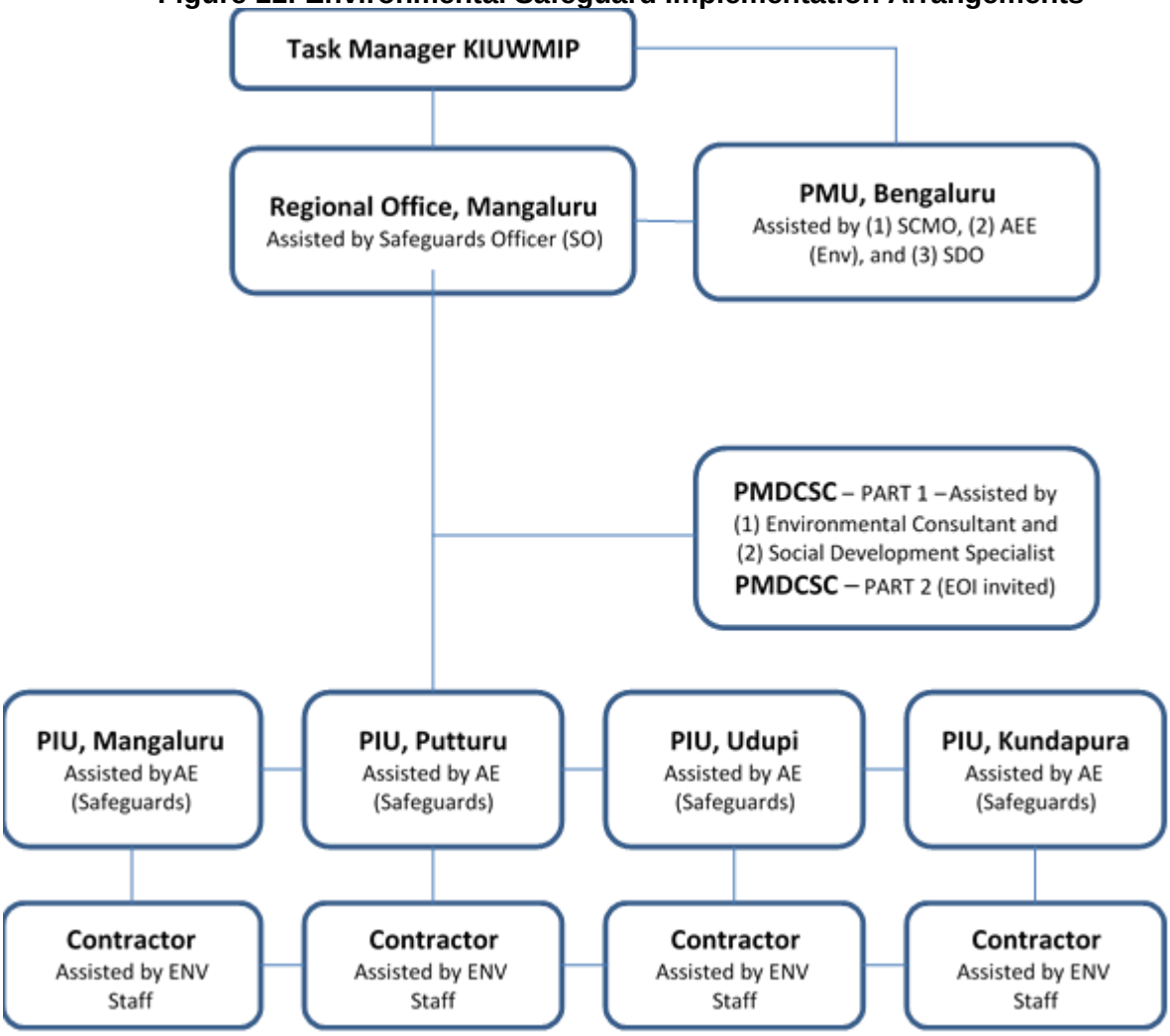
154. **Consultant Support**. A consultant team (Project Management, Design and Construction Supervision Consultant), based in Mangalore and with field teams in Tranche 2 programs towns will assist PIUs, RPMU and PMU in day-to-day implementation of the investment program. PMDCSC will be involved in all activities including in project planning, preparation, design of subproject and cost estimates, co-ordination, procurement, technical guidance, construction supervision, contract management, safeguards implementation and monitoring, capacity development and training etc., PMDCSC includes an Environmental Specialist consultant to implement the subprojects in compliance with EARF, and will be responsible for all safeguards tasks – preparation, implementation, monitoring and reporting. In each program town, a field team of PMDCSC will be mobilized and will include an Environmental Engineer for day-to-day implementation and monitoring of EMP implementation, and also to assist Environmental Specialist of PMDCSC.

155. **Contractor.** The contractor shall appoint one Safeguards (EHS) Engineer who will be responsible on a day-today basis for i) ensuring implementation of EMP ii) Coordinating the CSS and environment specialists (all levels) iii) community liaison, consultation with interested / affected parties and grievance redressal and iv) reporting.

156. KUIDFC will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities, on (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste, and on (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites.

157. The following Figure 11 and Table 16 summarizes the institutional responsibility of environmental safeguards at all stages of the project.

Figure 11: Environmental Safeguard Implementation Arrangements



AE = Assistant Engineer, AEE = ENV = environment, KIUWMIP = Karnataka Integrated Urban Water Management Investment Program, PIU = Program Implementation Unit, PMDCSC = Project Management Design and Construction Supervision Consultant, SCMO = Safeguards and Community Mobilization Officer, SDO = Social Development Officer.

Table 15: Institutional Roles and Responsibilities

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
Task Manager	(i) Review rapid environmental assessment (REA) checklists and assign categorization based on ADB Safeguard Policy Statement (SPS). (ii) Review and approve environmental impact assessment (EIA)/initial	(i) Task Manager is responsible for over-all environmental safeguards compliance of the project. (ii) Review and submit to ADB semi-annual monitoring reports. (iii) Review and submit Corrective Action Plans to ADB. (iv) Organize capacity building programs on environmental safeguards.	Compliance monitoring to review the environmental performance of project component, if required and as specified in EMP

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	environmental examination (IEE). (iii) Submit EIA/IEE to ADB for approval and disclosure in ADB website. (iv) Ensure approved IEEs are disclosed in Karnataka Urban Infrastructure Development and Finance Corporation (KUIDFC) website and summary posted in public areas accessible and understandable by local people. (v) Ensure environmental management plans (EMPs) are included in the bid documents and contracts. (vi) Organize an orientation workshop for Program Management Unit (PMU), urban local bodies (ULBs)/City Municipal Councils (CMCs), and all staff involved in the project implementation on (a) ADB SPS; (b) Government of India national, state, and local environmental laws and regulations; (c) core labor standards; (d) Occupational health and safety (OHS); and (e) EMP implementation especially spoil management, working in congested areas, public relations and ongoing consultations, grievance redress, etc. (vii) Assist in addressing any grievances brought about through the grievance redress mechanism (GRM) in a timely manner as per the IEEs.	(v) Coordinate with national and state level government agencies. (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.	
Assistant Executive Engineer (Environment)		(i) Assist in the preparation of semi-annual monitoring reports; (ii) Monitor and ensure compliance of EMPs as well as any other environmental provisions and conditions; (iii) If necessary prepare Corrective Action Plan and ensure implementation of corrective actions to ensure no environmental impacts; (iv) Organize capacity building programs on environmental safeguards at regional / divisional level; (v) Coordinate with regional level government agencies; (vi) Assist in addressing any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs; (vii) Assist in overseeing implementation of the EMP during construction including environmental, health and safety monitoring of contractors; and (viii) Coordinate with the General Manager, environmental Experts, ULBs/CMCs, NGOs, consultants and contractors on mitigation measures involving the community and affected persons and ensure that environmental concerns and suggestions are incorporated and implemented.	Compliance (Appendix 10) to review the environmental performance of project component, if required and as specified in EMP

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	(viii) Organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation. (ix) Ensure compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements. (x) Assist PMU, Program Implementation Units (PIUs), and project nongovernment organizations (NGOs) to document and develop good practice construction guidelines to assist the contractors in implementing the provisions of IEE. (xi) Assist in the review of the contractors' implementation plans to ensure compliance with the IEE.		
Safeguards Officer	(i) Coordinate public consultation and information disclosure; (ii) Liaise with local offices of regulatory agencies in obtaining clearances/approvals; (iii) Assist PMU for clearances obtained at state level; (iv) Review and approve contractors' updated EMPs;	(i) Oversee day-to-day implementation of EMP by contractors, including compliance with all government rules and regulations; (ii) Ensure continuous public consultation and awareness; (iii) Coordinate grievance redress process and ensure timely actions by all parties; and (iv) Review monthly contractors' EMP monitoring reports.	(i) Review and forward quarterly monitoring reports to PMU, (ii) Inform PMU of unanticipated impacts and formulate corrective action plan, (iii) Recommend issuance of work construction work completion certification to

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	(v) Take necessary action for obtaining rights of way; (vi) Inform affected persons on (a) project cutoff date, (b) public notice for schedule of land acquisition/ occupation, (c) entitlement matrix, and (d) compensation packages against different categories of loss and tentative schedule of land clearing/acquisition for starts of civil works activities; and (vii) Coordinate valuation of assets such as land, trees of various species, etc.		the contractor upon verification of satisfactory post-construction clean-up, (iv) Take corrective actions when necessary to ensure no adverse impacts, and (v) Submit monthly social and environmental monitoring reports to PMU.
Udupi CMC	(i) Conduct initial environmental assessment for proposed project using REA checklists and submit to PMU; (ii) Prepare EIA/IEE based on categorization and submit to PMU for approval; (iii) Ensure IEE is included in bid documents and contract agreements. Ensure cost of EMP implementation is provided; (iv) Disclose approved EIAs/IEEs; (v) Obtain all necessary clearances, permits, consents, NOCs, etc. Ensure compliance to the provisions and conditions; (vi) EMP implementation regarding sites for disposal of wastes, camps, storage areas, quarry sites, etc.; and (vii) Ensure contractors undergo EMP	(i) Ensure EMP implementation is included in measuring works carried out by the contractors and certifying payments; (ii) Ensure Corrective Action Plan is implemented. (ii) Conduct public awareness campaigns and participation programs; (iii) Prepare monthly reports; and (vi) Address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.	(i) Conducting environmental monitoring, as specified in the EMP. (ii) Issuance of clearance for contractor's post-construction activities as specified in the EMP.

Responsible Agency	Responsibility		
	Pre-Construction Stage	**Construction Stage**	**Post-Construction**
	implementation orientation prior to start of civil works.		
Consultant Environment Specialist at Udupi CMC level Construction Consultant Specialist at Udupi CMC level	(i) Assist ULBs/CMCs in preparation of REA checklists and EIAs/IEEs. (ii) Assist ULBs/CMCs in obtaining all necessary clearances, permits, consents, NOCs, etc. Ensure provisions and conditions are incorporated in the IEE and detailed design documents. (iii) Assist in ensuring IEE is included in bid documents and contract agreements. Assist in determining adequacy of cost for EMP implementation. (iv) Assist in addressing any concern related to IEE and EMP. (v) Assist in summarizing IEE and translating to language understood by local people.	(i) Monitor EMP implementation, (ii) Recommend corrective action measures for non-compliance by contractors, (iii) Assist in the review of monitoring reports submitted by contractors, (iv) Assist in the preparation of monthly reports, and (v) Assist in addressing any grievances brought about through the GRM in a timely manner as per the IEEs.	(i) Assist in the inspection and verification of contractor's post-construction activities.
Contractors	(i) Ensure EMP implementation cost is included in the methodology. (ii) Undergo EMP implementation orientation prior to award of contract. (iii) Provide EMP implementation orientation to all workers prior to deployment to worksites. (iv) Seek approval for camp sites and sources of materials. (v) Ensure copy of IEE is available at worksites. Summary of IEE is translated to language understood by workers and posted at visible places at all times.	(i) Implement EMP; (ii) Implement corrective actions if necessary; (iii) Prepare and submit monitoring reports including pictures to Udupi CMC; (iv) Comply with all applicable legislation, is conversant with the requirements of the EMP; (v) Brief his staff, employees, and laborer about the requirements of the EMP and provide environmental awareness training to staff, employees, and laborers; (vi) Ensure any sub-contractors/suppliers who are utilized within the context of the contract comply with all requirements of the EMP. The Contractor will be held responsible for non-compliance on their behalf;	(i) Ensure EMP post-construction requirements are satisfactorily complied (ii) Request certification from ULBs/CMCs

Responsible Agency	Responsibility		
	Pre-Construction Stage	Construction Stage	Post-Construction
		(vii) Bear the costs of any damages/compensation resulting from non-adherence to the EMP or written site instructions; (viii) Ensure that ULBs/CMCs and PMDCSC are timely informed of any foreseeable activities related to EMP implementation; and (ix) Address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.	

C. Training Needs

158. The following Table 17 presents the outline of capacity building program to ensure EMP implementation. The estimated cost (under PMU cost) is ₹225,000.00 (excluding trainings of contractors which will be part of EMP implementation cost during construction) to be covered by the project's capacity building program. The detailed cost and specific modules will be customized forth available skill set after assessing the capabilities of the target participants and their requirements of the project.

Table 17: Outline of Capacity Building Program on Environmental Management Plan Implementation

Description	Target Participants	Estimate (₹)	Cost and Source of Funds
1. Introduction and sensitization to environment issues (1 day) - ADB Safeguards Policy Statement - Government of India and Karnataka applicable safeguard laws, regulations and policies including but not limited to core labor standards, occupational health and safety (OHS), etc. - Incorporation of environmental management plan (EMP) into the project design and contracts - Monitoring, reporting and corrective action planning	All staff and consultants involved in the project	15,000	Program Management Unit (PMU) cost
2.EMP implementation (3 days) - Roles and responsibilities - OHS planning and implementation - Wastes management (water, hazardous, solid, excess construction materials, spoils, etc.) - Working in congested areas, - Public relations - Consultations - Grievance redress - Monitoring and corrective action planning - Reporting and disclosure - Post-construction planning	All staff and consultants involved in the project All contractors prior to award of contract	75,000	PMU cost
3. Plans and Protocols (3 days) - Construction site standard operating procedures (SOP) - Site-specific EMP - Traffic management plan - Spoils management plan - Waste management plan - Chance find protocol - O&M plans - Post-construction plan	All staff and consultants involved in the project All contractors prior to award of contract or during mobilization stage.	100,000 35,000	PMU cost Contractors cost as compliance to contract provisions on EMP implementation (refer to EMP tables)
4. Experiences and best practices sharing - Experiences on EMP implementation - Issues and challenges - Best practices followed	All staff and consultants involved in the project All contractors All nongovernment organizations (NGOs)	35,000	PMU Cost
5. Contractors Orientation to Workers on EMP implementation (OHS, core labor laws, spoils management, etc.)	All workers (including manual laborers) of the contractor prior to dispatch to worksite	40,000	Contractors cost as compliance to contract provisions on EMP implementation (refer to EMP tables)
Total cost for Capacity Building Program on EMP Implementation		**300,000**	

PMU cost	₹225,000
Contractor Cost	₹75,000
Total cost	₹300,000

D. Monitoring and Reporting

159. Prior to commencement of the work, the contractor will submit a compliance report to Udupi CMC ensuring that all identified pre-construction environmental impact mitigation measures as detailed in the EMP will be undertaken. Udupi CMC with the assistance of the environmental consultant will review the report and thereafter ULB will allow commencement of works.

160. During construction, results from internal monitoring by the contractor will be reflected in their weekly EMP implementation reports to the Resident Engineer. These weekly reports will be retained in PMDCSC for reference. Resident Engineer will review and advise contractor for corrective actions if necessary. Monthly report summarizing compliance and corrective measures taken will be prepared by Resident Engineer to be reviewed and endorsed by ULB and consolidated monthly report will be submitted to PMU. Based on monthly reports, PMU will review and submit SEMR to ADB for concurrence (twice a year) EMP implementation progress report (Appendix 10). Once concurrence from the ADB is received the report will be disclosed in the KUIDFC/ULB website.

161. ADB will review project performance against the KUIDFC's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of environmental and social safeguards will be integrated into the project performance management system.

162. ADB's monitoring and supervision activities are carried out on an on-going basis until a Project Completion Report (PCR) is issued. ADB issues a PCR within 1-2 years after the project is physically completed and in operation.

E. Environmental Management Plan Implementation Cost

163. Most of the mitigation measures require the contractors to adopt good site practice, which should be part of their normal procedures already, so there are unlikely to be major costs associated with compliance. Regardless of this, any costs of mitigation by the construction contractors or consultants are included in the budgets for the civil works and do not need to be estimated separately here.

164. Mitigation that is the responsibility of Udupi CMC will be provided as part of their management of the project, so this also does not need to be duplicated here. Cost for the capacity building program is included as part of the project. The EMP cost includes the cost for providing water supply and sanitation facilities for the workers. In addition to this, hard barricades need to be provided at the work sites to prevent any entry of the public or animals into the worksite and to prevent any possible accidents. Table 18 presents the environmental management cost of the subproject.

Table 168: Environmental Management Cost

	Particulars	Stages	Unit	Quantity	Rate	Cost (₹)	Costs Covered By
A. Implementation Staff							
1	Environmental, Health and Safety (EHS) Engineer	Construction	Per month	36	30,000	1,080,000	Civil works contract
B. Monitoring Measures							
1	Air quality monitoring	Pre-construction and Construction (pipe laying and overhead tanks or OHTs areas)	Per location	90	5,000	450,000	Civil works contract
2	Noise levels monitoring	Pre-construction and Construction (pipe laying and OHTs areas)	Per location	90	2,500	225,000	Civil works contract
3	Water quality	Pre-construction, Construction and Operation (Treated water, supply water)	Per location	30	10,000	300,000	Civil works contract
	Subtotal (B)					975,000	
C. Capacity Building							
1	Introduction and sensitization to environment issues	Pre-construction	Lump sum			15,000	PMU
2	EMP implementation	Construction	Lump sum			75,000	PMU
3	Plans and Protocols	Construction	Lump sum			100,000	PMU
			Lump sum			35,000	Civil works contract
4	Experiences and best practices sharing	Construction/ Post-Construction	Lump sum			35,000	PMU
5	Contractors Orientation to Workers on environmental management plan (EMP) implementation (OHS, core labor laws, spoils management, etc.)	Prior to dispatch to worksite	Lumpsum			40,000	Civil works contract
	Subtotal (C)					300,000	
D. Civil Works							
1	Construction of shelters for workers.	Construction	Lump sum			300,000	Civil works contract
2	Providing Water Supply Facility for the workers	Construction	Lump sum			200,000	Civil works contract

	Particulars	Stages	Unit	Quantity	Rate	Cost (₹)	Costs Covered By
3	Providing Sanitation Facility for the workers	Construction	Lump sum			200,000	Civil works contract
4	Barricades at the worksite (MS Sheet of 20 gauge of size 5 x 3 m, having vertical support by MS flat (65 x 65 x 6 mm) along the sides and at 1.5 m and 3.5m, horizontal support by MS flat (65 x 65 x 6 mm) along the sides and at the center, supported by 50mm MS hollow pies of 4 m height at the ends and at the center.	Construction	Per unit	10	15,000	150,000	Civil works contract
5	Retro reflectorized Traffic Signs as per IRC:67, M 15 grade, 80 x 60 mm rectangular; fixed over Aluminum sheeting supported on MS angle iron.	Construction	Per unit	6	3500	21,000	Civil works contract
6	Retro reflectorized Traffic Signs as per IRC:67, M 15 grade, 60 x 60 mm square; fixed over Aluminum sheeting supported on MS angle iron.	Construction	Per unit	6	3000	18,000	Civil works contract
	Subtotal (D)					889,000	
	Total (A+B+C+D)					3,244,000	

PMU cost - ₹190,000
Contractor Cost - ₹3,054,000
Total - ₹3,244,000

IX. CONCLUSION AND RECOMMENDATIONS

165. The process described in this document has assessed the environmental impacts of all elements of the Udupi Water Supply subproject. All potential impacts were identified in relation to pre-construction, construction, and operation phases. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible. Subproject is unlikely to have any significant impacts in relation to design or location.

166. The subproject components are located in Udupi urban area. No private land required for this subproject. There are no environmentally-sensitive areas such as protected areas, wetlands, mangroves, or estuaries in or near the subproject locations. The bulk water system component sites are located mostly outside the urban area – intake site is located on the bank of River Varahi, and water treatment plant (WTP) site is located adjacent to existing WTP in Baje. WTP site located in a forest land[6] but the area and its surroundings have already been developed and not considered environmentally-sensitive area. The transmission pipeline will be laid along roads ROW.

167. At present, River Swarna is the main source of water supply of Udupi, and under the government-funded bulk water supply project, it is proposed develop an additional source (River Varahi) because the flow in River Swarna is very low during summer season (available only for duration of 101 days from February to May. The proposed new source, together with the existing, will ensure adequate water supply for Udupi throughout the year. The Varahi Hydal Power Project (VHPP) and an irrigation weir is located on the upstream site of proposed intake. VHPP discharges 1,100 cubic feet per second (cusec) of water into river course throughout year, of which 800 cusec is for irrigation use and remaining 300 cusec is available for drinking and river flow purposes. At present, Kundapura is the only major town in the downstream of the proposed Udupi intake. Kundapura is also utilizing River Varahi with a total demand of 7.6 million liters per day (MLD) or 3.9 cusec. With Udupi's design demand of 48 MLD or 20 cusec, the combined demand of the two towns is 23.9 cusec or 7.97% of the available flow. Thus 92% of remaining flow or 74 cusec will be available for downstream users. Therefore, there are no significant impacts related to source sustainability or downstream impacts.

168. No significant impacts are anticipated either due to location or design of the subproject as the sites are selected and fixed ensuring components are not located in environmentally-sensitive areas. However due to the project sites being in urban areas and nature of open cut method for pipelaying works, unavoidable impacts include (i) health and safety hazards to workers during construction and operation; (ii) noise and dust from construction activities; (iii) increased road traffic due to interference of construction activities; (iv) soil erosion/silt runoff from construction waste soils;[7] and (v) increased sewage flow due to increased water supply. These impacts during construction and operation can be mitigated through good and high-quality construction and operations and maintenance (O&M) practices. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be affecting small areas only.

[6] "Forest land" is land owned and/or managed by Forest Department. The WTP site is a forest land but not part of any protected or environmentally-sensitive area. Diversion of forest lands into non-forest uses will require permission from the Forest Department. Clearances, compensatory afforestation and payment of levies are compulsory for using forest lands.

[7] Quantity of waste soil to be generated from pipe laying works and OHT excavation is about 154,763 cubic meter (m3). Based on discussions with design engineers and PMDCSC, 90-95% of the waste soil will be utilized for refill and remaining soil (~15,476 m^3) will need to be disposed-off safely.

169. Mitigation will be assured by a program of environmental monitoring conducted during construction and operation to ensure that all measures are implemented, and to determine whether the environment is protected as intended. This will include observations on- and off-site, document checks, and interviews with workers and beneficiaries, and any requirements for remedial action will be reported to PMU. There will also be longer-term surveys to monitor the expected improvements in the quality of domestic water and the health of the population. There will also be regular and periodic monitoring surveys for quality of water (at intake, reservoirs and at consumer end).

170. The public participation processes undertaken during project design ensured stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

171. The project's grievance redressal mechanism will provide the citizens with a platform for redressal of their grievances, and describes the informal and formal channels, time frame, and mechanisms for resolving complaints about environmental performance. The EMP will assist the PMU, PIU, PMDCSC and contractors in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project. The EMP will also ensure efficient lines of communication between the implementing agency, project management unit, and contractors.

172. The citizens of the Udupi will be the major beneficiaries of this subproject as the environmental condition and over-all health of the community will be improved. With the improved bulk water supply, they will be provided with a constant supply of better quality water, piped into their homes. The replacement of old distribution lines shall avoid cross contamination and have positive benefit on health by avoiding diseases such as diarrhoea and dysentery, resulting in less expenses on healthcare, improve working days and their economic status.

173. The Udupi Water Supply System subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

174. Based on the findings of the IEE, there are no significant impacts and the subproject as Category "B" is confirmed. No further study or detailed environmental impact assessment (EIA) is required to comply with ADB SPS (2009). This IEE is prepared based on detailed engineering design and needs to be updated in future (during design validation, preconstruction and construction phases) for changes in project components, design locations or construction processes.

175. Environmental Clearance requirement per Government of India Environmental Impact Assessment Act and its Notifications are not applicable to this subproject. No environment-related statutory clearance or permissions required for ADB-funded components. The government-funded bulk water intake will require permission from Irrigation and while the WTP will require clearance from the Forest Department.

RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST

Table A1. Rapid Environmental Assessment Checklist of Udupi Water Supply Subproject – 24 x 7 Water Supply Distribution Network for Udupi

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the project area			
▪ Densely populated?	X		Subproject activities extend to the entire City including the densely populated areas at Udupi are Manipal, Shivalli, Malpe, Parkala, Thenkapete, Siribeedu,Bailoor, Santhekatte, Kalyanpura,Kakkunje, Ambalpaday, Brahamagiri, Karavali Junction There are no major negative impacts envisaged, because water supply network will be located in unused government lands alongside the existing roads and can be constructed without causing disturbance to houses and commercial establishments. In narrow streets, disruption to road users is likely, and measures like best activity scheduling/ traffic management, alternative routes, and prior information to road users, houses and shops will minimize the impact to acceptable levels. The construction of the new overhead storage reservoir site is located on the outskirts
▪ Heavy with development activities?	X		Udupi is a developing City; urban expansion is considerable.
▪ Adjacent to or within any environmentally sensitive areas?		x	
▪ Cultural heritage site		x	
▪ Protected Area		x	
▪ Wetland		x	
▪ Mangrove		x	
▪ Estuarine		x	
▪ Buffer zone of protected area		x	
▪ Special area for protecting biodiversity		x	
▪ Bay		x	
B. Potential Environmental Impacts Will the Project cause			
▪ Pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		x	Subproject will utilize the existing surface sources; no source improvement / augmentation proposed in the subproject
▪ Impairment of historical/cultural monuments/ areas and loss/damage to these sites?		x	There is no historical / cultural monument in the project location.
▪ Hazard of land subsidence caused by excessive ground water pumping?		x	No ground water source will be used for this project.
▪ Social conflicts arising from displacement of communities?		x	The subproject for Udupi Water Supply Scheme requires seven lands, and all are government land

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		x	No source improvement/ augmentation proposed in the subproject
▪ Unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		x	Subproject involves supply of treated water.
▪ Delivery of unsafe water to distribution system?		X	Subproject involves distribution of treated water supplies
▪ Inadequate protection of intake works or wells, leading to pollution of water supply?		X	Subproject will utilize the existing surface sources; no source improvement/augmentation proposed in the subproject
▪ Over pumping of ground water, leading to salinization and ground subsidence?		X	No ground water is proposed to be abstracted.
▪ Excessive algal growth in storage reservoir?		X	Regular cleaning of storage reservoir shall be ensured to avoid algal growth in the reservoir
▪ Increase in production of sewage beyond capabilities of community facilities?		X	Sewerage system of adequate capacity including treatment is being designed by KIUWMIP
▪ Inadequate disposal of sludge from water treatment plants?		x	Backwash water reuse plant and sludge management taken up under the government-funded bulk water supply project
▪ Inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		x	
▪ Impairments associated with transmission lines and access roads?	x		Anticipated during construction activities. However, impacts are temporary and short in duration. The EMP includes measure to mitigate impacts.
▪ Health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		x	Subproject does not include the design and construction of chlorine facilities and receiving, storing and handling of other hazardous chemicals.
▪ Health and safety hazards to workers from the management of chlorine used for disinfection and other contaminants?		x	In the existing WTP, the Chlorination system is not working properly. Hence the new (one working +one standby) chlorinators are proposed.
▪ Dislocation or involuntary resettlement of people	x		There may be temporary disturbance to business and squatters/vendors during construction. A resettlement plan shall mitigate/compensate these impacts.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		x	Not applicable

SCREENING QUESTIONS	Yes	No	REMARKS
▪ Noise and dust from construction activities?	x		Short term impact on air quality due to dust generation during construction activities is anticipated. Appropriate dust suppression measures will be taken to minimize dust generation due to construction activities at site. No significant increase in noise level is anticipated due to construction. All equipment and machineries will conform to the Statutory norms.
▪ Increased road traffic due to interference of construction activities?	x		Proper traffic management and planning will be ensured during construction.
▪ continuing soil erosion/silt runoff from construction operations?	x		Construction work during monsoon shall be carried out with due care so that silt run off due to construction operation is prevented. No construction will be allowed during rains.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		x	Trained and skilled staff will be deployed for O&M. Also, quality of treated water will be regularly monitored through water sample testing to ensure delivery of safe water to consumers
▪ Delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		x	HDPE pipes will be used for distribution system and are noncorrosive in nature.
▪ accidental leakage of chlorine gas?		x	Safety measures are considered
▪ Excessive abstraction of water affecting downstream water users?		x	Subproject will utilize the existing surface sources; no source improvement / augmentation proposed in the subproject.
▪ competing uses of water?		x	Not applicable.
▪ increased sewage flow due to increased water supply	x		Presently Udupi covers only 17% sewerage system. For entire Udupi it is proposed to take up in this project. its in planning stage.
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	x		Sewerage system of adequate capacity including treatment is being proposed under KIUWMIP
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		x	No such impact anticipated as the import of workforce will be limited to skilled workers; local communities in the vicinity of the project would be employed as much as possible.
▪ social conflicts if workers from other regions or countries are hired?		x	Not anticipated as local communities within the project vicinity will be employed as much as possible.

SCREENING QUESTIONS	Yes	No	REMARKS
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		x	Not applicable. Construction will not involve use of explosives and chemicals.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.		x	Operational area will be clearly demarcated and access will be controlled. Only workers and project concerned members will be allowed to visit the operational sites

ENVIRONMENTAL AND LABOR RELATED LEGISLATIONS IN INDIA

1. Environmental Related Legislations

1. The Water (Prevention and Control of Pollution) Act, 1974, amended 1988
2. The Water (Prevention and Control of Pollution) Rules, 1975
3. The Water (Prevention and Control of Pollution) Cess Rules, 1971
4. The Air (Prevention and Control of Pollution) Act 1981, amended 1987
5. The Air (Prevention and Control of Pollution) Rules, 1982
6. The Environment (Protection) Act, 1986, amended in 1991 and including the following Rules/Notification issued under this Act
7. The Environment (Protection) Rules, 1986, including amendments
8. The Solid Wastes Management Rules, 2016
9. The Hazardous Wastes (Management and Handling) Rules, 1989
10. The Bio-Medical Waste (Management and Handling) Rules, 1998
11. Noise Pollution (Regulation and Control) Rules, 2000,
12. Wild Life (Protection) Amendment Act, 2002
13. Environmental Impact Assessment Notification, 2006
14. Environmental Standards of Central Pollution Control Board (CPCB)
15. The Indian Wildlife (Protection) Act, 1972, amended 1993
16. The Wildlife (Protection) Rules, 1995
17. The Indian Forest Act, 1927
18. Forest (Conservation) Act, 1980, amended 1988
19. Forest (Conservation) Rules, 1981 amended 1992 and 2003
20. Guidelines for Diversion of Forest Lands for Non-Forest Purpose under the Forest (Conservation) Act, 1980
21. Ancient Monuments and Archaeological Sites and Remains Act 1958
22. Ancient Monuments and Archaeological Sites and Remains Rules 1959
23. Government of India Notification of 1992 under the above-stated Rules
24. Coastal Regulation Zone (CRZ) Notification from MOEF.

2. Salient Features of Major Labor Laws in India

Including Amendments Issued from Time to Time Applicable to Establishments Engaged in Construction of Civil Works

(i) Workmen Compensation Act, 1923 - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

(ii) Payment of Gratuity Act, 1972 - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(iii) Employees' PF and Miscellaneous Provisions Act, 1952 - The Act provides for monthly contributions by the employer plus workers @10 % or 8.33 %. The benefits payable under the Act are:

- (a) Pension or family pension on retirement or death as the case may be;
- (b) deposit linked insurance on the death in harness of the worker; and
- (c) payment of PF accumulation on retirement/death, etc.

(iv) Maternity Benefit Act, 1951 - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage, etc.

(v) Contract Labor (Regulation and Abolition) Act, 1970 - The Act provides for certain welfare measures to be provided by the Contractor to contract labor and in case the Contractor fails to provide, the same are required to be provided by the Principal Employer by Law. The principal employer is required to take Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act is applicable to the establishments or Contractor of principal employer if they employ 20 or more contract labor.

(vi) Minimum Wages Act, 1948 - The employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employment.

(vii) Payment of Wages Act, 1936 - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

(viii) Equal Remuneration Act, 1979 - The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in the matters of transfers, training and promotions, etc.

(ix) Payment of Bonus Act, 1965 - The Act is applicable to all establishments employing 20 or more workmen. The Act provides for payments of annual bonus subject to a minimum of 8.33% of wages and maximum of 20% of wages to employees drawing ₹3,500 per month or less. The bonus to be paid to employees getting ₹2,500 per month or above up to ₹3,500 per month shall be worked out by taking wages as ₹2,500 per month only. The Act does not apply to certain establishments. The newly set up establishments are exempted for five years in certain circumstances. Some of the State Governments have reduced the employment size from 20 to 10 for the purpose of applicability of the Act.

(x) Industrial Disputes Act, 1947 - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(xi) Industrial Employment (Standing Orders) Act, 1946 - It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the employer on matters provided in the Act and get the same certified by the designated Authority.

(xii) Trade Unions Act, 1926 - The Act lays down the procedure for registration of trade unions of workmen and employees. The trade unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(xiii) Child Labor (Prohibition and Regulation) Act, 1986 - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of child labor is prohibited in Building and Construction Industry.

(xiv) Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979 - The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act

becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996 - All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

APPLICABLE AMBIENT AIR QUALITY AND NOISE STANDARDS

Table 1: Applicable Ambient Air Quality Standards

Parameter	Location[a]	Applicable Standards Per ADB SPS[e] ($\mu g/m^3$)
PM_{10}	Industrial Residential, Rural and Other Areas	20 (Annual) [c] 50 (24-hr) [c]
	Sensitive Area	20 (Annual) [c] 50 (24-hr) [c]
PM_{25}	Industrial Residential, Rural and Other Areas	10 (Annual) [c] 25 (24-hr) [c]
	Sensitive Area	10 (Annual) [c] 25 (24-hr) [c]
SO_2	Industrial Residential, Rural and Other Areas	50 (Annual) [b] 20 (24-hr) [c] 500 (10-min) [c]
	Sensitive Area	20 (Annual) [b] 20 (24-hr) [c] 500 (10-min) [c]
NO_2	Industrial Residential, Rural and Other Areas	40 (Annual) [b] 80 (24-hr) [b] 200 (1-hr) [c]
	Sensitive Area	30 (Annual) [b] 80 (24-hr) [b] 200 (1-hr) [c]
CO	Industrial Residential, Rural and Other Areas	2,000 (8-hr) [b] 4,000 (1-hr) [b] 100,000 (15-min)[d]
	Sensitive Area	2,000 (8-hr) [b] 4,000 (1-hr) [b] 100,000 (15-min)[d]
Ozone (O_3)	Industrial Residential, Rural and Other Areas	100 (8-hr) [b] 180 (1-hr) [b]
	Sensitive Area	100 (8-hr) [b] 180 (1-hr) [b]
Lead (Pb)	Industrial, Residential, Rural and Other Areas	0.5 (Annual) [b] 1.0 (24-hr) [b]
	Sensitive Area	0.5 (Annual) [b] 1.0 (24-hr) [b]
Ammonia (NH_3)	Industrial Residential, Rural and Other Areas	100 (Annual) [b] 400 (24-hr) [b]
	Sensitive Area	100 (Annual) [b] 400 (24-hr) [b]
Benzene (C_6H_6)	Industrial Residential, Rural and Other Areas	5 (Annual) [b]
	Sensitive Area	5 (Annual) [b]
Benzo(o)pyrene (BaP) particulate phase only	Industrial Residential, Rural and Other Areas	0.001 (Annual) [b]
	Sensitive Area	0.001 (Annual) [b]
Arsenic (As)	Industrial Residential, Rural and Other Areas	0.006 (Annual) [b]
	Sensitive Area	0.006 (Annual) [b]

Parameter	Location[a]	Applicable Standards Per ADB SPS[e] (µg/m^3)
Nickel (Ni)	Industrial Residential, Rural and Other Areas	0.02 (Annual) [b]
	Sensitive Area	0.02 (Annual) [b]

[a] Sensitive area refers to such areas notified by the India Central Government.
[b] Notification by Ministry of Environment and Forests, Government of India Environment (Protection) Seventh Amendment Rules, 2009.
[c] WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide. *Global update 2005*. WHO. 2006.
[d] Air Quality Guidelines for Europe Second Edition. WHO 2000.
[e] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

Table 2: Applicable Ambient Noise Standards

Receptor/ Source	Applicable Standards Per ADB SPS[a] (dBA)	
	Day time	Night time
Industrial area	70[b]	70[b]
Commercial area	65[c]	55[c]
Residential Area	55[c]	45[c]
Silent Zone	50[c]	40[c]

[a] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.
[b] Guidelines for Community Noise. WHO. 1999.
[c] Noise Pollution (Regulation and Control) Rules, 2002 as amended up to 2010.

APPLICABLE STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS (EFFLUENT)

Pollutants	Units	Applicable Standard per ADB SPS [a, b, c]
pH	pH	6 – 9 [b]
BOD	mg/l	20 [a]
COD	mg/l	125 [b]
Total nitrogen	mg/l	10 [b]
Total phosphorus	mg/l	2 [b]
Oil and grease	mg/l	10 [b]
Total suspended solids	mg/l	<50 [a]
Total coliform bacteria	MPN b / 100 ml	400a [b]

[a] Environment (Protection) Amendment Rules, 2017.
[b] Health-based guideline values.
[c] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

APPLICABLE DRINKING WATER STANDARDS

Group	Parameter	Unit	Applicable Standards Per ADB SPS [a, c, d]
Physical	Turbidity	NTU	1 (5) [a]
	pH		6.5 – 8.5 [a]
	Color	Hazen units	5 (15) [a]
	Taste and Odor		Agreeable [a]
	TDS	mg/l	500 (2,000) [a]
	Iron	mg/l	0.3 [a]
	Manganese	mg/l	0.1 (0.3) [a]
	Arsenic	mg/l	0.01 [a]
	Cadmium	mg/l	0.003 [a]
	Chromium	mg/l	0.05 [a]
	Cyanide	mg/l	0.05 [a]
	Fluoride	mg/l	1 (1.5) [a]
	Lead	mg/l	0.01 [a]
	Ammonia	mg/l	0.5 [a]
Chemical	Chloride	mg/l	250 (1,000) [a]
	Sulphate	mg/l	200 (400) [a]
	Nitrate	mg/l	45 [a]
	Copper	mg/l	0.05 (1.5) [a]
	Total Hardness	mg/l	200 (600) [a]
	Calcium	mg/l	75 (200) [a]
	Zinc	mg/l	5 (15) [a]
	Mercury	mg/l	0.001 [a]
	Aluminum	mg/l	0.1 (0.3) [a]
	Residual Chlorine	mg/l	0.2 [a]
Micro Germs	E-coli	MPN/100ml	Must not be detectable in any 100 ml sample [a]
	Total Coliform	MPN/100ml	

[a] Bureau of India Standard 10200: 2012.
[b] Health-based guideline values.
[c] Per ADB SPS, the government shall achieve whichever of the ambient air quality standards is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the executing agency of the government will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.
[d] Figures in parenthesis are maximum limits allowed in the absence of alternate source.

SAMPLE OUTLINE SPOILS (CONSTRUCTION WASTE) MANAGEMENT PLAN

- The Spoil Management Plan should be site specific and be part of the monthly Construction Management Plan.
- The contractor, in consultation with the PIU, has to find out appropriate location/s for the disposal of the excess soil generated. The spoils should be deposited only at these sites.
- Further precautions need to be taken in case of the contaminated spoils
- The vehicle carrying the spoil should be covered properly.
- The spoils generating from each site should be removed on the same day or immediately after the work is complete. The site / road should be restored to the original condition.

I. Spoils information

The spoil information contains the details like (i) type/material; (ii) potential contamination by that type; (iii) expected volume (site/component specific); and (iv) spoil classification, etc.

II. Spoils management

The Spoil Management section gives the details of (i) transportation of spoil; (ii) disposal site details; (iii) precautions taken; (iv) volume of contaminated spoil, if present; and (v) suggested reuse of disposal of the spoil.

III. Documentation

The volume of spoil generated (site specific, date wise), site disposed, reuse/disposal details should be documented properly.

TRAFFIC MANAGEMENT PLANNING

A. Principles for TMP around the Water Pipes Construction Sites

One of the prime objectives of this TMP is to ensure the safety of all the road users along the work zone, and to address the following issues:

(i) the safety of pedestrians, bicyclists, and motorists travelling through the construction zone;
(ii) protection of work crews from hazards associated with moving traffic;
(iii) mitigation of the adverse impact on road capacity and delays to the road users;
(iv) maintenance of access to adjoining properties; and
(v) Addressing issues that may delay the project.

B. Operating Policies for Traffic Management Planning

The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

(i) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
(ii) Inhibit traffic movement as little as possible.
(iii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
(iv) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
(v) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
(vi) Train all persons that select, place, and maintain temporary traffic control devices.
(vii) Keep the public well informed.
(viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

Figures A2 to Figure A12 illustrate the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure:

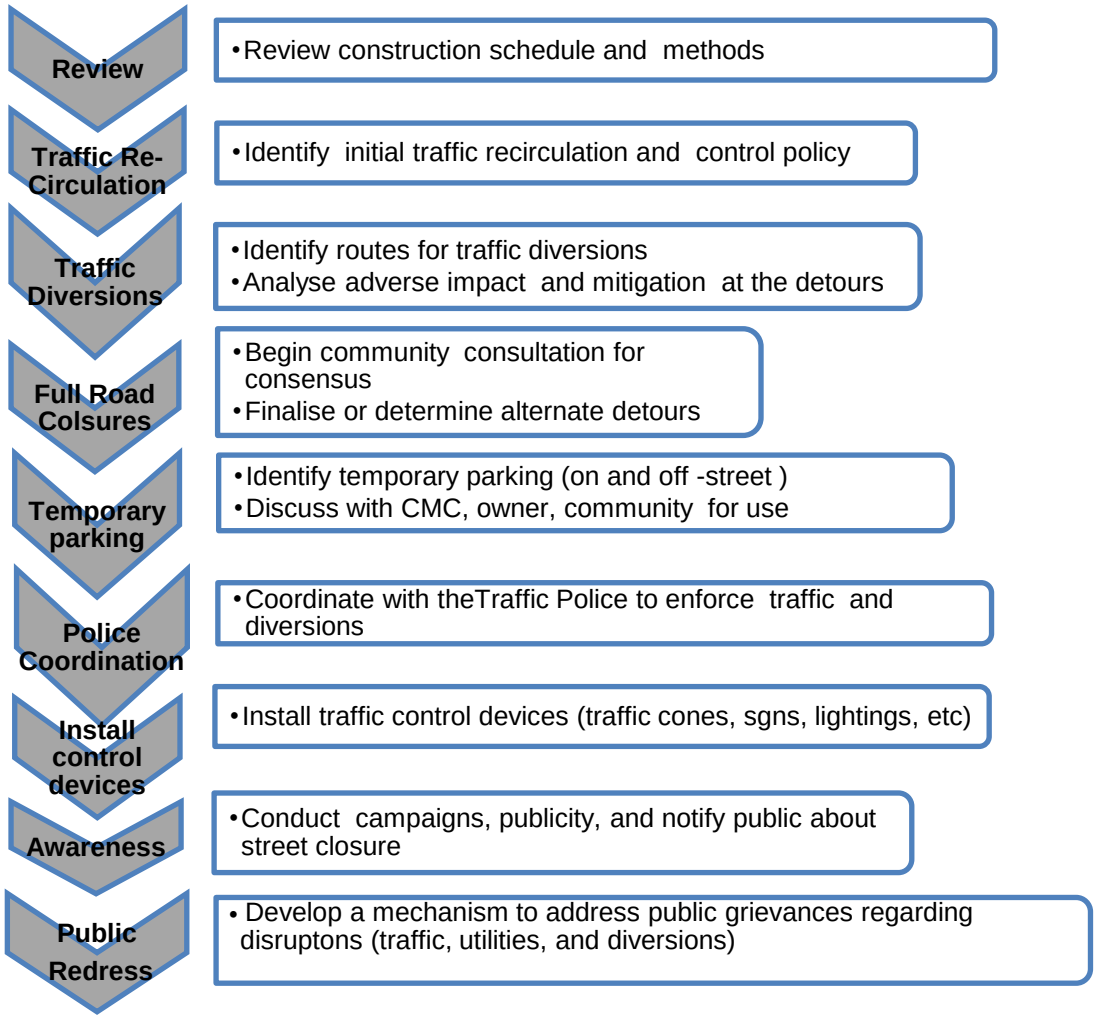
Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) Approval from the Udupi Corporation / Public Works Department (PWD) to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc., regarding the mitigation measures necessary at the detours where the road is diverted during the construction;

(iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
(iv) determining if additional traffic control or temporary improvements are needed along the detour route;
(v) considering how access will be provided to the worksite;
(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
(vii) Developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the Detour Street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Figure A1: Policy Steps for the TMP



D. Public Awareness and Notifications

As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, although on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and City level meeting with the elected representatives.

The PIU will also conduct an awareness campaign to educate the public about the following issues:

(i) Traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
(ii) Defensive driving behavior along the work zones; and
(iii) Reduced speeds enforced at the work zones and traffic diversions.

It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centers. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

(i) Explain why the brochure was prepared, along with a brief description of the project;
(ii) Advise the public to expect the unexpected;
(iii) Educate the public about the various traffic control devices and safety measures adopted at the work zones;
(iv) Educate the public about the safe road user behavior to emulate at the work zones;
(v) Tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
(vi) Indicate the office hours of relevant offices.

E. Install traffic Control Devices at the Work Zones and Traffic Diversion Routes

The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

- Signs
- Pavement Markings
- Channelizing Devices
- Arrow Panels
- Warning Lights

Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new subproject sites and alignments are wide but in old City roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

Figures A2 to A12 illustrate a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

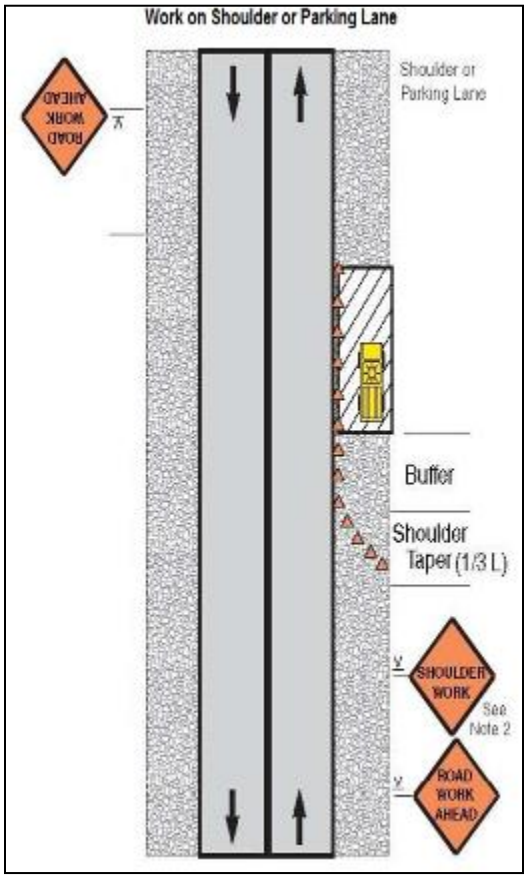
- Work on shoulder or parking lane
- Shoulder or parking lane closed on divided road
- Work in Travel lane
- Lane closure on road with low volume
- Lane closure on a two-line road with low volume (with yield sign)
- Lane closure on a two-line road with low volume (one flagger operation)
- Lane closure on a two-lane road (two flagger operation)
- Lane closure on a four-lane undivided Road
- Lane closure on divided roadway
- Half road closure on multi-lane roadway
- Street closure with detour

The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons (preferably the LED type) for regulating the traffic during night time.

In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

Figure A2 and A3: Work on Shoulder or Parking Lane and Shoulder or Parking Lane Closed on Divided Road



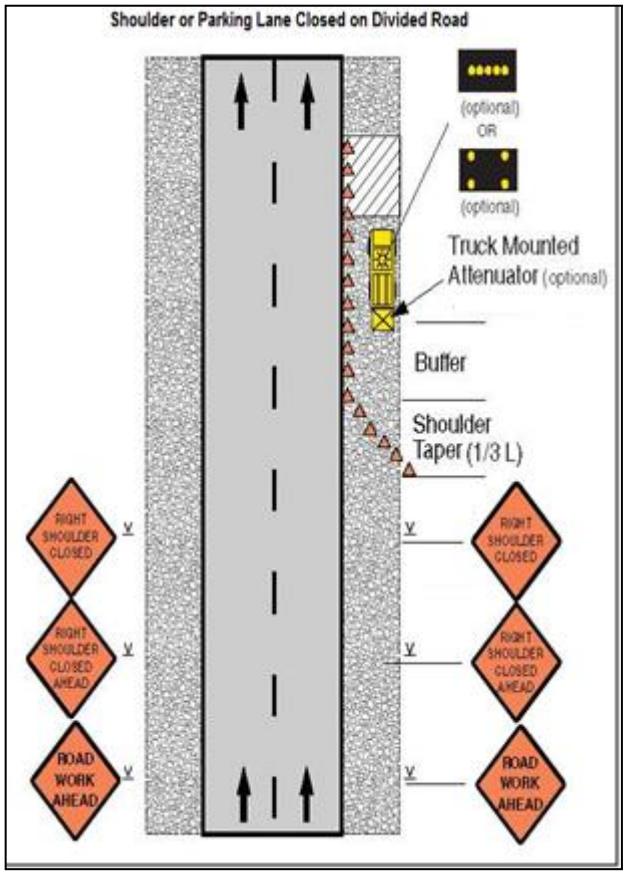
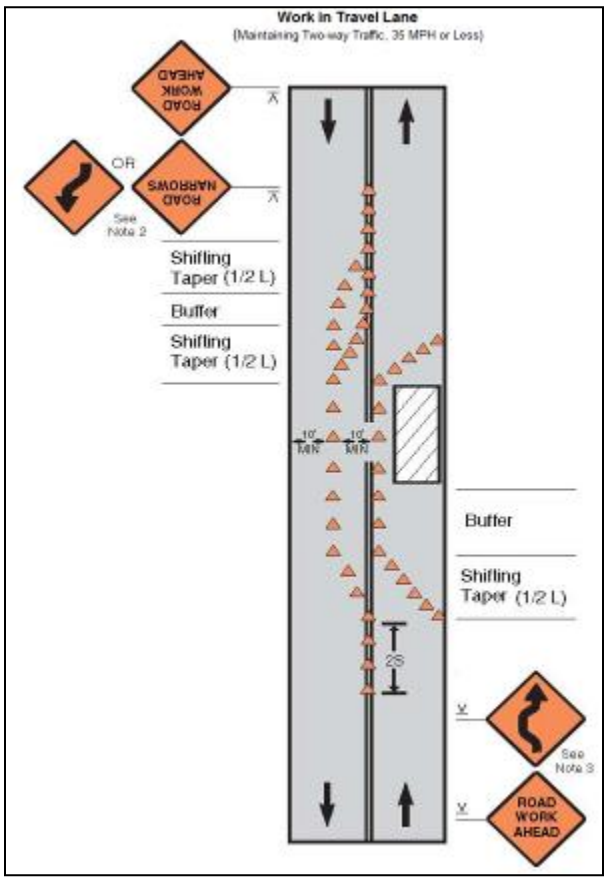


Figure A4 and A5: Work in Travel lane and Lane closure on road with low volume



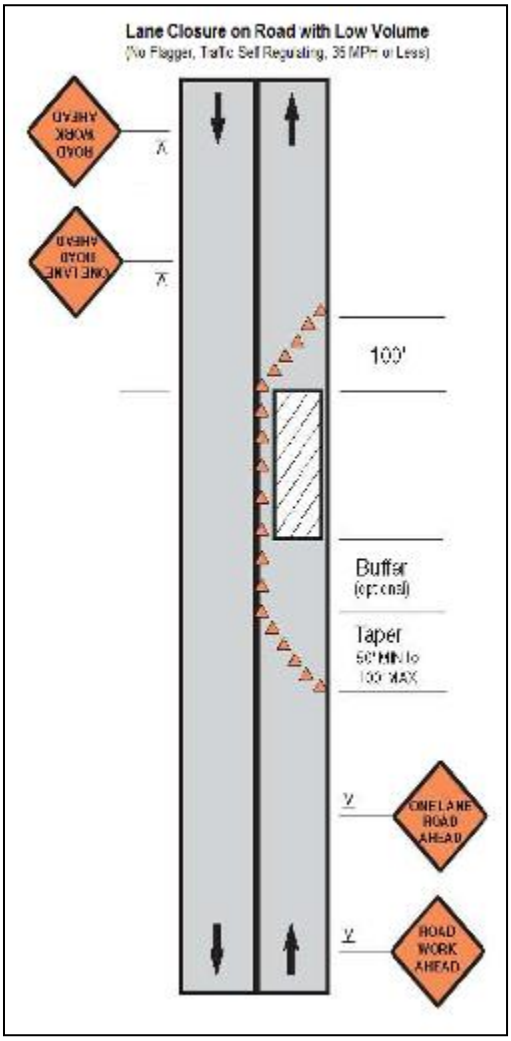
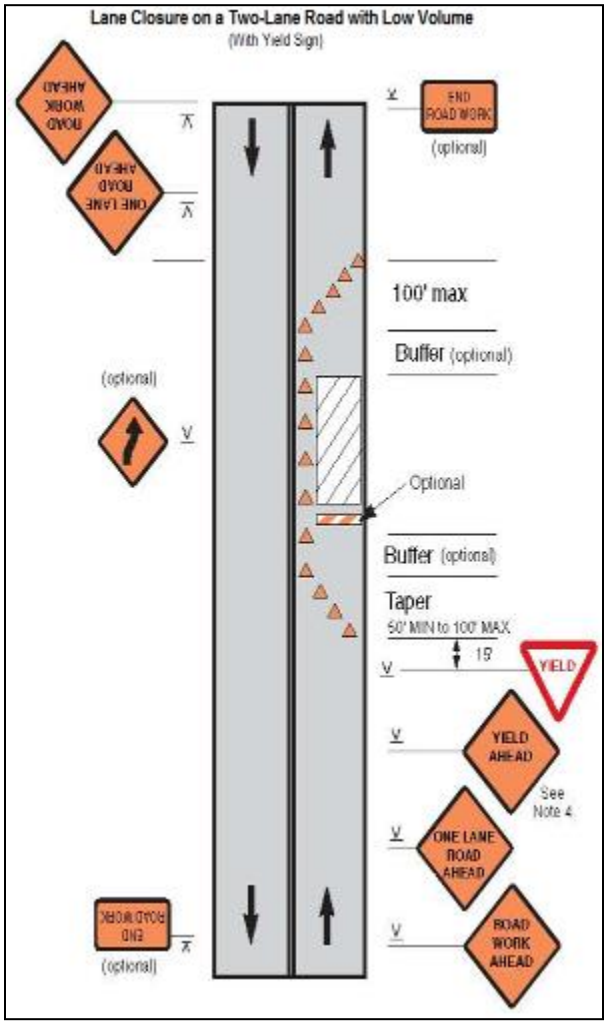


Figure A6 and A7: Lane closure on a two-line road with low volume (with yield sign) and Lane closure on a two-line road with low volume (one flagger operation)



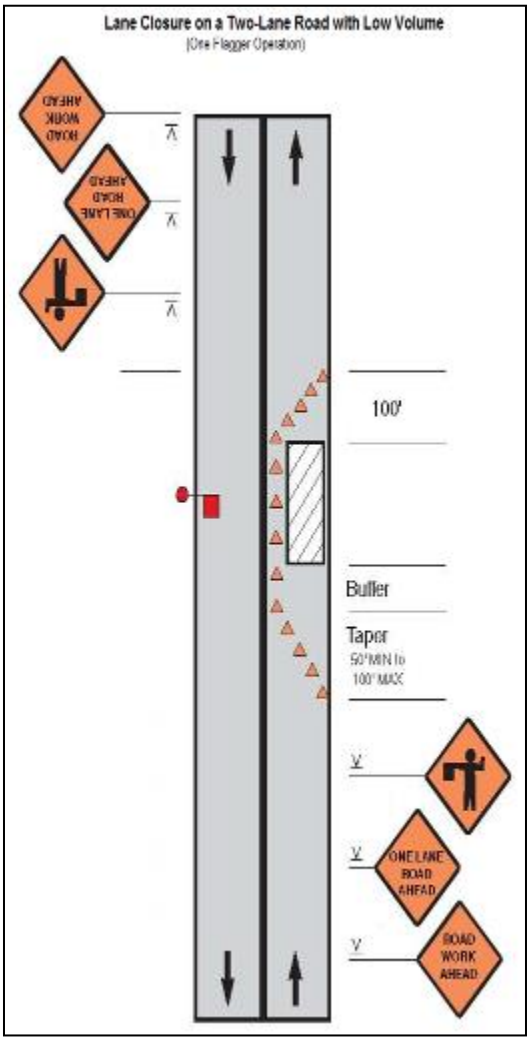
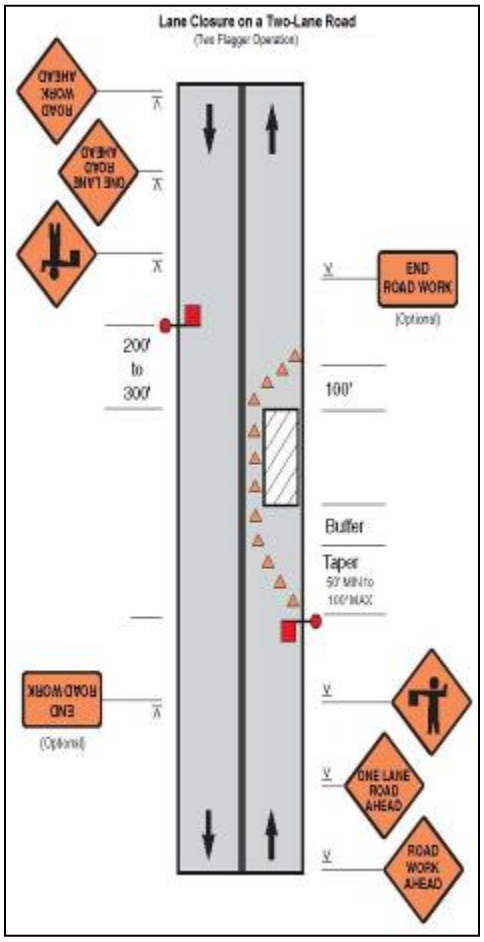


Figure A8 and A9: Lane closure on a two lane road (two flagger operation) and Lane closure on a four lane undivided Road



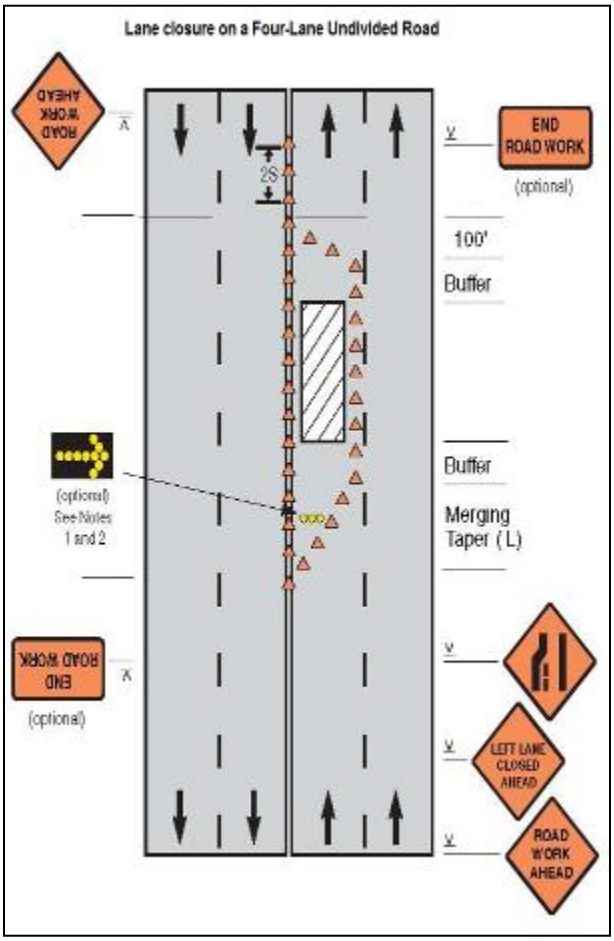
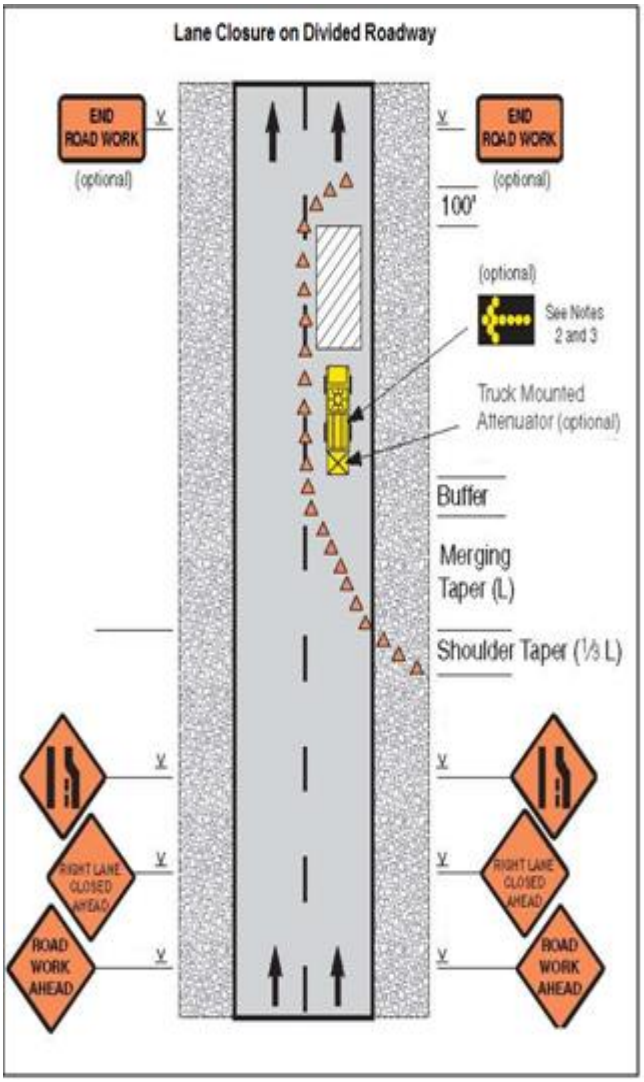


Figure A10 and A11: Lane Closure on Divided Roadway and Half Road Closure on Multi-lane Roadway



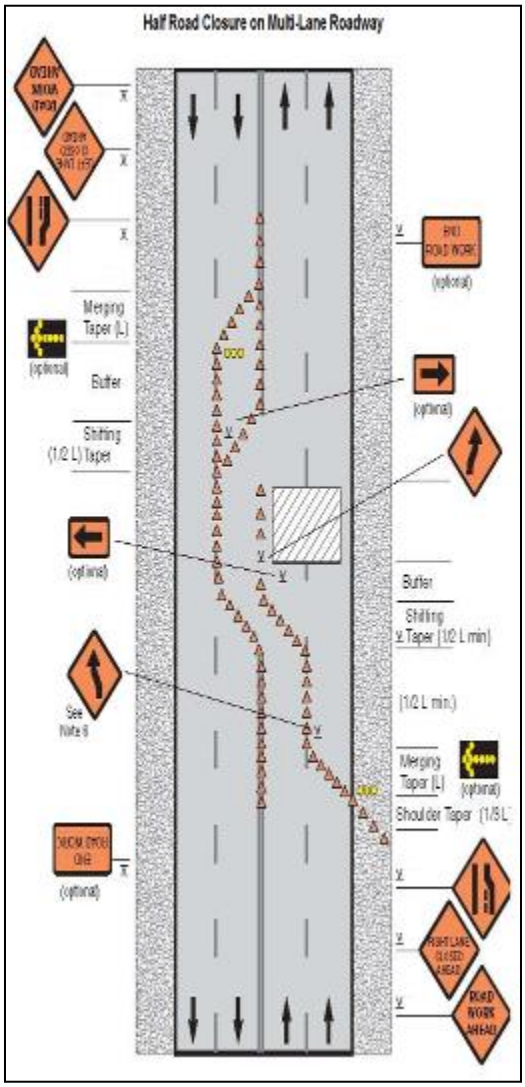
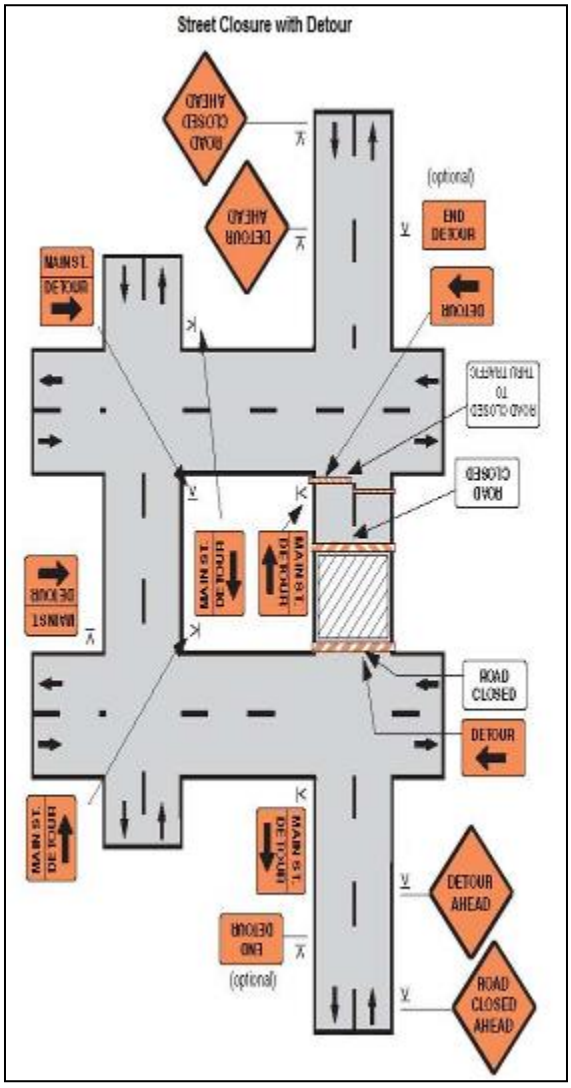


Figure A12: Street Closure with Detour



URBAN LOCAL BODY'S RESOLUTION FOR THE PREPARATION OF DETAILED PROJECT REPORT FOR WATER SUPPLY UNDER ADB ASSISTANCE

ಉನಸ/ಇ4/ಸಿಆರ್/ /2016-17 ದಿನಾಂಕ:05.04.2016

ರಿಗೆ,
ಜಿ.ಕೆ.ಡಬ್ಲ್ಯು ಕನ್ಸಲ್ಟ್ ಜಿಎಮ್‌ಬಿಎಚ್
ಅಮೃತೇಶ್ವರಿ ಅಪಾರ್ಟ್‌ಮೆಂಟ್
ಡೊಂಗರ್‌ಕೇರಿ ಮಂಗಳೂರು

ವಿಷಯ:-ಉಡುಪಿ ನಗರಸಭಾ ವ್ಯಾಪ್ತಿಯಲ್ಲಿ ಎಡಿಬಿ 2ನೇ ಹಂತದ ನೀರು ಸರಬರಾಜು ಯೋಜನೆಯ ಡಿಪಿಆರ್ ನ್ನು ತಯಾರಿಸುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ:-1) ದಿನಾಂಕ 01.03.2016ರ ಪತ್ರ : ಉನಸ:ಇ4:ಸಿಆರ್:2015-16
2) ದಿನಾಂಕ 30.01.2016ರ ಸಾಮಾನ್ಯ ಸಭೆಯ ನಿರ್ಣಯ ಸಂಖ್ಯೆ 640
3) ಜಿ.ಕೆ.ಡಬ್ಲ್ಯು ಕನ್ಸಲ್‌ಟೆಂಟ್ ಇವರ ಕಂಪ್ಲೈನ್ಸ್ ರಿಪೋರ್ಟ್ ದಿನಾಂಕ 22.03.2006, 23-35-00020/03-16/385
4) ಜಿ.ಕೆ.ಡಬ್ಲ್ಯು ಕನ್ಸಲ್‌ಟೆಂಟ್ ಇವರ ದಿನಾಂಕ 4.12.2016 ರಿವಿಸ್ಡ್ ಸರ್ವೆ ಮಾಡಲು ವಿನಂತಿ ಪತ್ರ, 23-35-00020/12-15/296

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ಮೇಲಿನ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಉಲ್ಲೇಖ (1)ರಲ್ಲಿ ಸೂಚಿಸಿರುವ **observation** ಗಳಿಗೆ **M/S GKW Consult** ಇವರು ಉಲ್ಲೇಖ(3)ರಲ್ಲಿ ಅನುಪಾಲನ ವರದಿ ಕೊಟ್ಟಿರುತ್ತಾರೆ. ಉಲ್ಲೇಖ (1)ರ ಪತ್ರದಲ್ಲಿ 6 ಮೇಲ್ಮಟ್ಟದ ಸಂಗ್ರಹಣಾ ತೊಟ್ಟಿಯ ಪೈಕಿ, 4 ಮೇಲ್ಮಟ್ಟದ ಸಂಗ್ರಹಣಾ ತೊಟ್ಟಿಗೆ ಬದಲಿ ಸ್ಥಳಗಳನ್ನು ತೋರಿಸಿದ್ದು, ತೋರಿಸಿರುವಂತಹ 4 ಸ್ಥಳಗಳಲ್ಲಿ ಎರಡು ಸ್ಥಳಗಳು ಮೇಲ್ಮಟ್ಟದ ಸಂಗ್ರಹಣಾ ತೊಟ್ಟಿಯನ್ನು ನಿರ್ಮಿಸಲು ತಾಂತ್ರಿಕವಾಗಿ ಸೂಕ್ತವಾಗಿರುವುದೆಂದು ಉಲ್ಲೇಖ(3)ರಲ್ಲಿ ತಿಳಿಸಿರುತ್ತಾರೆ.

ತದನಂತರ ಉಲ್ಲೇಖ(4)ರಂತೆ ದಿನಾಂಕ 28.03.2016 ಹಾಗೂ 29.03.2016 ರಂದು ಕಂದಾಯ ಇಲಾಖೆಯ ಸರ್ವೇಯರ್‌ಗಳಿಂದ ಅಗತ್ಯವಿರುವ ಸ್ಥಳಗಳಲ್ಲಿ ಸರ್ವೆಯನ್ನು ಮಾಡಲಾಗಿದ್ದು, ಡಿ.ಸಿ.ಎಂ ಕಾಲನಿ(ವಲಯ 8ಅ) ಹಾಗೂ ವಿ.ಪಿ ನಗರದಲ್ಲಿ (ವಲಯ 4) ಗುರುತಿಸಿದ ಸ್ಥಳಗಳು ಖಾಸಗಿ ಮಾಲಕತ್ವದಲ್ಲಿರುತ್ತದೆ ಎಂದು ತಿಳಿದು ಬಂದಿರುತ್ತದೆ. ಈ ಸ್ಥಳಗಳಿಗೆ ಬದಲಾಗಿ ದಿನಾಂಕ 31.03.2016ರಂದು ಬದಲೀ ಸರಕಾರಿ ಸ್ಥಳಗಳನ್ನು (ಇಂದ್ರಾಳಿ ಮತ್ತು ಮಣಿಪಾಲ)ದಲ್ಲಿ ಗುರುತಿಸಲಾಗಿದೆ. ಅದಲ್ಲದೆ ವಲಯ 8-ಅಯನ್ನು ಉಪವಲಯ ಮಾಡಿ ಅದಕ್ಕೆ ಗೋರಕ್ಷ ಆಸ್ಪತ್ರೆ ಎದುರು ಇರುವಂತಹ ಸರಕಾರಿ ಜಾಗದಲ್ಲಿ ಇನ್ನೊಂದು ಮೇಲ್ಮಟ್ಟದ ಸ್ಥಾವರ ಮಾಡಲು ಸ್ಥಳವಿರುತ್ತದೆ. ಈ ಈ ಮೂರು ಸ್ಥಳಗಳಲ್ಲಿ ಮೇಲ್ಮಟ್ಟದ ನೀರು ಸಂಗ್ರಹಣಾ ತೊಟ್ಟಿಯನ್ನು ನಿರ್ಮಿಸಲು ತಾಂತ್ರಿಕವಾಗಿ ಕಾರ್ಯ ಸಾಧನೆಯನ್ನು ಪರಿಶೀಲಿಸಿ ಸೂಕ್ತವೆಂದು ಕಂಡುಬಂದಲ್ಲಿ ಅದನ್ನು ಪರಿಗಣಿಸಿ ವಿಸ್ತೃತವಾದ ಯೋಜನಾ ವರದಿ (ಡಿ.ಪಿ.ಆರ್)ಯನ್ನು ತಯಾರಿಸಿ ಸಲ್ಲಿಸಲು ಕೋರಲಾಗಿದೆ.

ತಮ್ಮ ಪತ್ರ ಉಲ್ಲೇಖ(3)ರಲ್ಲಿ ಶೀರೂರು ಅಣೆಕಟ್ಟಿನ ಹಾಲಿ ಇರುವ ಎತ್ತರದಿಂದ 1.5 ಮೀ ಎತ್ತರಕ್ಕೆ ಎತ್ತರಿಸಿ ಯಾಂತ್ರಿಕೃತ ಕಬ್ಬಿಣದ ಬಾಗಿಲುಗಳನ್ನು ಅಳವಡಿಸುವ ಕಾಮಗಾರಿಯನ್ನು ಅಮೃತ್ ಯೋಜನೆಯಲ್ಲಿ ಪರಿಗಣಿಸಲು ತಿಳಿಸಿರುತ್ತೀರಿ. ಆದರೆ ಈ ಕಾಮಗಾರಿಯು ಅಮೃತ್ ಯೋಜನೆಯಲ್ಲಿ ಪರಿಗಣಿಸದೇ ಇರುವುದರಿಂದ ಪ್ರಸ್ತುತ ಮಾಡುತ್ತಿರುವ ವಿಸ್ತೃತ ಯೋಜನಾ ವರದಿಯಲ್ಲಿ ಸೇರಿಸ ಬೇಕಾಗಿ ಕೋರಲಾಗಿದೆ.

ಪೌರಾಯುಕ್ತರು
ಉಡುಪಿ ನಗರಸಭೆ

STAKEHOLDER CONSULTATION MEETINGS AT VARIOUS SITES IN UDUPI

Name of the ULB: City Municipal Council Udupi
Project components: 24x7 water supply for Udupi
Water supply subproject: Laying of water supply distribution network and construction of overhead tanks in Udupi

Date: 20 October 2016

Public consultation was conducted in the surrounding areas of all 7 proposed OHTs' construction sites and also distribution network areas. It was observed that there were no social safeguards issues in those areas. However, during construction, focus will be given for RPF of ADB to address the social safeguards issues if any.

Photographs of Public Consultation

Anganawadi Manipal. Ward Councillor Mr. Narasimha Nayak (First person from left side), Executive Engineer- KIUWMIP, Social Development Officers were present in the consultation.	
Public consultation- Veternary Hospital Manipal along with Ward Councilor	
Public consultation with the shop owners at Mannampalla, Manipal	 

Consultation with Smt. Ammanni Ramanna Shetty Memorial Hall and Sri. Siddi Vinayaka temple Kolambe Volakadu Udupi

Public Consultations in Kolambe Volakadu, Udupi

Consultation with the local residents by the Ward Councillors Mrs. Jyothi and Mr. Chandrakanth (Second person from right side), Executive Engineer KUIWMIP and Social Development Officer in Kakkunje

Ward Councillor Mrs. Shobha (First person from the left side) and Mr. Chandrakanth (Fifth person from the left side) and also local residents in Public consultation at Santhekatte, Udupi

Public Consultation in Santhekatte Udupi

Public Consultation in Indrali, Udupi

Door to Door Public consultation in Vyvahar Garden along with Ward Counsellor Mrs..Hemalatha Hilari Jathan, Executive Engineer KUIWMIP and Social Development Officer

Photographs of Public Consultation – Raw Water Pipe Alignment
(Government funded of Bulk Water Supply Project)

Consultation with the villager of Kulunje village

Consultation with the vegetable shop Hebri Road,

	Haladi
 Consultation with the shop owner Hebri Road, Haladi	 Consultation with the Ex- Gram Panchayat Vice President of Haladi in his shop.
 Consultation with the shop owner of Chirodi Village	 Consultation with the flower stall owner of Shiroor Moorkai, Hegguje Village
 Consultation with shop owner in Kukkehalli Village	

Table A9.1: Public Consultation

No.	Name and Address of the Person Consulted	Contact No.	Present Condition of Water Supply	What Improvement is Required in the Present Condition	Contacted Person is the Beneficiary of the Proposed Project Yes/ No	Proposed Project Cause Any Social Issue? Yes/ No	Suggestions for the Proposed Project
1	Mrs. Lalitha W/o Sathish Anganawadi Teacher, Anganawadi centre Adarsha Nagar-2 Near Veterinary Hospital Manipal	9482252922	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
2	Ms. Swathi D/o Kumar Veterinary Hospital Manipal	9448134852	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
3	Mr. Amith S/o Alfans D'souza Ananth Nagar 2nd Stage Manipal	9008759342	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
4	Mr. Ramanda Nayak S/o Raghunatha Nayak	9880041374	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
5	Mr. Fieem S/o Kayyam Ananth Nagar	9663039865	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
6	Mrs. Shalini Varnekar W/o Ramakanth Varnekar Door No 129/16A Ananth Nagar Manipal	8277032878	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
7	Mr. Vijaya Suvarna S/o Narayana Bangera Sri Devi Nagara Kakkunje Kunjibettu Post Shivalli Village Udupi	9844952723	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as an earliest.
8	Mr. Sunil Shetty S/o Laxman Shetty Sri. Durga Nilaya Door No	8971150687	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as

No.	Name and Address of the Person Consulted	Contact No.	Present Condition of Water Supply	What Improvement is Required in the Present Condition	Contacted Person is the Beneficiary of the Proposed Project Yes/ No	Proposed Project Cause Any Social Issue? Yes/ No	Suggestions for the Proposed Project
	11-3B Post Santhekatte Ambagilu Udupi						soon as an earliest.
9	Mr. Ganesh N Suvarna S/o Narayana Bangera Devi Nagara Kunjibettu Post Shivalli Village Udupi	9880274732	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
10	Mrs. Lalitha W/o Bhaskar Poojari Mathrushri Nilaya Shivalli village Kunjibettu Post Udupi	9901622684	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
11	Mr. Srinivas Acharya S/o Padmanabha Acharya Post Kunjibettu Shivalli village Udupi	9632475277	Daily 6AM to 10.30 AM	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
12	Mr. Sathish Palan S/o Appu Taxi stand Santhekatte Udupi	9845387100	No water supply from the CMC	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
13	Mr. T. Ramesh Pai S/o Gopalakrishna Pai Kote Road Kalyanpura Udupi	9243966432	No water supply from the CMC	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
14	Mr. Sampath S/o Balakrishna Taxi stand Santhekatte Udupi	9591178782	No water supply from the CMC	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
15	Mr. Baburaya Achari S/o Ramakrishna Achari Nejar Kelarkatte Santhekatte Udupi	9845863661	No water supply from the CMC	24x7 water supply	Yes	No	Project need to be completed as soon as possible.
16	Mr. Ramesh S/o Kogganna Naik Kelarbettu Santhekatte Udupi	9945727033	No water supply from the CMC	24x7 water supply	Yes	No	Project need to be completed as soon as possible.

No.	Name and Address of the Person Consulted	Contact No.	Present Condition of Water Supply	What Improvement is Required in the Present Condition	Contacted Person is the Beneficiary of the Proposed Project Yes/ No	Proposed Project Cause Any Social Issue? Yes/ No	Suggestions for the Proposed Project
17	Mr. Ramesh S/o Nadu Hindu Crematorium Indrali Udupi	9902574072	Daily 6AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
18	Mr. B. G Pai S/o Annappa Pai Sri. Malasa krupa No 11 Vyavahar Gardens Kukkikatte Udupi	9900404721 0820-2592669	Daily 6AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
19	Mr. S Vishwanath Prabhu S/o Late S. Gopal Rao Door No 2-159/C Namrtha Vyavahar Garden Kukkikatte Udupi	8123719475 0820-2592652	Daily 6AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
20	Mr. Sridhara Acharya S/o Giriappa Acharya Door No 2/157/A Near Vyavahar Garden Manchi Mulasthan Udupi	9886997878	Daily 6AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
21	Mrs. Mercina W/o Nelson Door No 2-154C Manchi Mulasthan Road Kukkikatte Udupi	9880156361	Daily 6AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
22	Mr. Rafiq S/o Imamsaheb Door No 2-155A Kukkikatte Udupi	8970276871	Daily 6AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as an earliest.
23	Mrs. Ammanniyamma W/o A. P Jayagopal Kolambe Bailur Udupi	9964330800	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.
24	Mrs. Laxmi W/o T. R Venkatesh Door No 5-2-39C Kolambe Bailur 76 Badagabettu Udupi	9972019562	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.
25	Mr. Murugan S/o P. Raju Door No 5-2-39D Kolambe Bailur	8710031012	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.

No.	Name and Address of the Person Consulted	Contact No.	Present Condition of Water Supply	What Improvement is Required in the Present Condition	Contacted Person is the Beneficiary of the Proposed Project Yes/ No	Proposed Project Cause Any Social Issue? Yes/ No	Suggestions for the Proposed Project
26	Mrs. Chithra W/o Ganesh Door No 5-2-39 Kolambe Bailur 76 Badagabettu Udupi	8453838757	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.
27	Mrs. Pushpa W/o Gopal Door No 5-2-46C Kolambe Bailur 76 Badagabettu Udupi	9743651316	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as an earliest.
28	Mrs. Shantha W/o Armuga Door No 5-2-39 Kolambe Bailur 76 Badagabettu Udupi	9035035641	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as an earliest.
29	Mr. Chandrahas Shetty Smt. Ammanni Ramanna Shetty Memorial Hall and Sri. Siddi Vinayaka temple Kolambe Volakadu Udupi	9880125757 0820-2522513	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.
30	Mr. Mohammed Zabir S/o K. Hassansaheb Popular Seat covers Indrali Udupi	9880941924	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.
31	Mr. Rajendra S/o Srinivas Vittal laundry Indrali Udupi	9008000909	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.
32	Mrs. Parvathi Ganesh sweets Indrali Udupi	7760231030	Daily 7 AM to 11 AM	24x7 water supply	Yes	No	Project need to be completed as early as possible.

SEMI ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE

I. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)[a]	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

[a] If on-going construction, include %physical progress and expected date of completion.

II. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS[a]

Package No.	Subproject Name	Statutory Environmental Requirements[b]	Status of Compliance[c]	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish[d]

[a] All statutory clearance/s, no-objection certificates, permit/s, etc. should be obtained prior to award of contract/s. Attach as appendix all clearance obtained during the reporting period. If already reported, specify in the "remarks" column.
[b] Specify (environmental clearance? Permit/consent to establish? Forest clearance? Etc.)
[c] Specify if obtained, submitted and awaiting approval, application not yet submitted.
[d] *Example: Environmental Clearance requires ambient air quality monitoring, Forest Clearance/Tree-cutting Permit requires 2 trees for every tree, etc.*

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

- Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	Components	Design Status (Preliminary Design Stage/Detailed Design Completed)	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below
- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

(i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

(ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Provide information on
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)[a]

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

[a] Attach Laboratory Results and Sampling Map/Locations.

Overall Compliance with CEMP/EMP

No.	Sub-Project Name	EMP/ CEMP Part of Contract Documents (Y/N)	CEMP/ EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

VI. MONITORING OF ENVIRONMENTAL IMPACTS ON PROJECT SURROUNDINGS (ambient air, water quality and noise levels)

- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

Site No.	Date of Sampling	Site Location	Parameters (Government Standards)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Site No.	Date of Sampling	Site Location	Parameters (Monitoring Results)					
			pH	Conductivity µS/cm	BOD mg/L	TSS mg/L	TN mg/L	TP mg/L

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Monitoring Results)	
			Day Time	Night Time

VII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

APPENDIXES
- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection report
- Other

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name
Contract Number

NAME: _____ DATE: _____
TITLE: _____ DMA: _____
LOCATION: _____ GROUP: _____

WEATHER CONDITION:
_____

INITIAL SITE CONDITION: _____

CONCLUDING SITE CONDITION:

Satisfactory _____ Unsatisfactory _____ Incident _____Resolved _____ Unresolved _____

INCIDENT:
Nature of incident:
_____

Intervention Steps:
_____

Incident Issues

Resolution

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

Inspection

Emissions	Waste Minimization
Air Quality	Reuse and Recycling
Noise pollution	Dust and Litter Control
Hazardous Substances	Trees and Vegetation

Site Restored to Original Condition Yes ☐ No ☐

Signature
_____

Sign off

_____ _____

Name **Name**
Position **Position**

SAMPLE CHECKLIST FOR CONSTRUCTION SAFETY

No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
1	Appointment of qualified EHS engineer						
2	Approval for construction safety management plan by the PMDCSC						
3	Approval for traffic management/control plan in accordance with IRC: SP: 55-2001						
4	Maintenance of the existing road stretches handed over to the contractor.						
5	Provision of temporary traffic barriers/barricades/caution tapes in construction zones						
6	Provision of traffic signboards						
7	Provision for flags and warning lights						
9	Providing plastic crash barrier						
10	Provision of adequate staging, form work, and access (ladders with handrail) for works at a height of more than 3 m						
11	Provision of adequate shoring / bracing/barricading/lighting for all deep excavations of more than 3 m depth.						
12	Demarcations (fencing, guarding, and watching) at construction sites						
13	Provision for sufficient lighting, especially for night time work						
14	Arrangements for controlled access and entry to construction zones						
15	Safety arrangements for road users/pedestrians						
16	Arrangements for detouring traffic to alternate facilities						
17	Regular inspection of work zone traffic control devices by authorized contractor personnel						
18	Construction workers' safety - Provision of personnel protective equipment						
19	A. Helmets						
	B. Safety shoes						
	C. Dust masks						
	D. Hand gloves						
	E. Safety belts						
	F. Reflective jackets						
	G. Earplugs for labor						

No.	Safety Issues	Yes	No	Non-Compliance	Corrective Action	Penalty	Remarks
20	Workers employed on bituminous works, stone crushers, concrete batching plants, etc. provided with protective goggles, gloves, gumboots, etc.						
21	Workers engaged in welding work shall be provided with welder protective shields						
22	All vehicles are provided with reverse horns.						
23	All scaffolds, ladders, and other safety devices shall be maintained in safe and sound condition.						
24	Regular health check-up for labor/ contractor's personnel						
25	Ensuring sanitary conditions and all waste disposal procedures and methods in the camps.						
26	The contractor shall provide adequate circuit for traffic flow around construction areas, control speed of construction vehicles through road safety and training of drivers, provide adequate signage, barriers, and flag persons for traffic control						
27	Provision of insurance coverage for the contractor's personnel						

Contractor Consultant

ENVIRONMENTAL AUDIT OF THE EXISTING WATER TREATMENT PLANT IN UDUPI

I. Introduction

The objectives of this environmental audit are to (i) assess the compliance of the existing water treatment plant (WTP) to be rehabilitated/augmented during the implementation of KIUWMIP with environmental legislation; (ii) improve environmental performance through monitoring the effectiveness of the management system; and (iii) increase the Udupi CMC's knowledge of itself and its activities, thus increasing its ability to continually improve and minimize future potential liabilities.

The environmental audit was carried out for the existing WTP. The methodology adopted for this audit was to initially review existing plans and technical information and list various activities being carried out in the WTP. Due diligence was carried out to physically check whether environmental performance, health and safety, etc. were in compliance with national and state prescribed standards and guidelines. Team visited the WTP and observed operations. Meetings and discussions with key personnel were held in the various stages of the audit. Various documentations regarding the operational aspects were also checked.

II. Description of Existing Water Treatment Plant at Udupi

Location	Udupi City Latitude:13°33'N Longitude:74°74'E
Start of operation (year)	2006
Owned by	CMC, Udupi
Contact person and designation	Mr. Ragavendra Environmental Engineer +919448507244
Capacity	27.24 million liters per day (MLD)
Water supply source	River Swarna, (intake well is 12 km from Udupi)
Water treatment process	Technology: The treatment process is conventional, and has following units: Cascade Aerator, Raw Water Channel with Parshall Flume or continuous flow measurement, Coagulant & Flocculent chemical make up tanks, Flash Mixing tank, Clariflocculator including a flocculation zone in the center, six sand filters, Chlorination system and Clear water Sump & pump house.
	Materials: All civil structures are made of reinforced cement concrete, and mechanical units like the of HYSD steel. Process: the water from raw water pumping main enters into the inlet, and the first unit is cascade aerator. After aeration water passes through Parshall flume, where flow is measured. Coagulant and flocculent chemicals (alum and Lime) are added to the water, and mixed in the flash mixer tank, and then flows into Clariflocculator and Clarified water flows into sand filters (3 numbers) for filtration and the filtered water is disinfected with chlorine and allowed to flow into clear water tank from where water pumped into service reservoirs for distribution.
Backwash water and sludge management	-filter backwash water is let into open drains as there is no recycling of backwash into inlet - the settled sludge from the bottom of the clarifier tank is periodically flushed into the drains.

	-the untreated backwash and sludge flushing ultimately reaches and disposed off into drain.
Chlorination system	Chlorine dosage system is not properly working; there are no safety precautions in place. Chlorination done at Master Balancing reservoir at Manipal instead of WTP site. Chlorine cylinders (900 kg tonners) are used which is placed at one side of the room. No safety systems like leak detection or emergency alarm or lime slurry pit available in the facility. Operators are not aware of safety measures or actions to be performed during any emergency.